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THE BULLETIN

OF THE

U. S. Army Medical Department

A periodical containing original articles, reviews, news, and abstracts of interest to the Medical Department of the Army

ISSUED UNDER THE AUSPICES OF THE OFFICE OF THE SURGEON GENERAL By direction of the Secretary of War, the material contained herein is published as administrative information and is required for the proper transaction of the public business.

NORMAN T. KIRK, Major General, U. S. Army, The Surgeon General.

Distriction Go gle

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U. S. Army Medical Department

ISSUED MONTHLY

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
WASHINTON 25, D. C.



HOLOGY LIBRARY, THE BULLETIN

OF THE

U.S. Army Medical Department

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Annual subscription: \$2.00; foreign subscription: \$2.50. Single copies, domestic, 25 cents; foreign, 30 cents.

All other communications relating to this publication should be addressed to The Surgeon General, U. S. Army, Washington 25, D. C.



UH223 A15 12072-83

Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

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The New Year

To every individual member of the Medical Department of the Army serving this country in the tropics, in the desert, in arctic regions, in Europe and Asia, and at home, I send greetings from the personnel of The Surgeon General's Office, and add my own fervid hope that you will keep well and be happy throughout the new year.

You have written a glorious chapter in the history of medicine and of your own United States in the year just closed. No soldiers have ever been more loyally and effectively served by their medical comrades than were the members of our armed forces on the battlefields of 1943.

The year now before us may offer still more and greater opportunities for such service to the wounded and the sick. I am sure that you will be more than equal to any service for our country that lies ahead. This office will do its best to support and help you.

NORMAN T. KIRK,
Major General, U. S. Army,
The Surgeon General.



News and Comment

PENICILLIN THERAPY OF SURGICAL INFECTIONS

The Office of The Surgeon General has sponsored two units for penicillin therapy, one at Bushnell General Hospital and one at Halloran General Hospital, both of which have functioned as schools for training selected officers in that type of therapy. The specially trained officers then took part in a program the aim of which was to define the effectiveness of penicillin in surgical infections. A report of this work has recently been published. In the program for evaluating penicillin, each one of several general hospitals set aside a ward for penicillin therapy under the direction of the specially trained officer and the chief of the surgical service. Nearly all cases treated were in single rooms or cubicles, and the surgical dressings were done under sterile operating-room technique. One of the units taking part (the Halloran General Hospital) set up special chemical and bacteriologic laboratory facilities, while at other hospitals special liaison was established with the routine laboratories, allowing for special treatment of problems on the penicillin ward.

The data accumulated by the various clinical groups are reviewed in the foregoing report in the following order:

- (1) Methods of administration, dosage, and reactions.
- (2) Experience in treatment of acute pyogenic infections.
- (3) Experience in the treatment of chronically septic compound fractures with observations on the bacteria of war wounds and the anemia of chronic sepsis.

Penicillin was administered intravenously, intramuscularly, intrathecally, and locally, and the indications for each route were established. A preference was expressed for the intramuscular route for the routine systemic administration. However, intravenous therapy is used for the constant administration of the drug in cases of immediately life-endangering infections. Penicillin has been injected into the lumbar space, the ventricles, and the cistern in the treatment of meningitis, and local treatment has been supplemental and effective in wounds appropriate for topical therapy.

^{1.} Lyons, Champ: Penicillin Therapy of Surgical Infections, J. Am. M. Ass., 18 December 1943.



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In the report of this study, it is concluded that pencillin is an effective antibacterial agent in the treatment of acute infections caused by staphylococci, hemolytic and nonhemolytic streptococci, mixed infections due to gram-positive bacteria and actinomycosis. The gram-negative diplococci are susceptible to treatment. Gram-negative bacilli are resistant. Mixed infections with both gram-positive and gram-negative bacteria may be benefited through the effect on the susceptible bacterial species. Malaria has not been controlled by penicillin.

An intensive investigation of the clinical status of patients with chronically infected gunshot fractures has revealed a major deficiency of red blood cells and hemoglobin. Positive nitrogen balance may be established in the presence of continuing infection, but the synthesis of new tissue proteins and the regeneration of red cells and hemoglobin depend on control of the infection. The dramatic effectiveness of penicillin in rapidly establishing this phase of convalescence is added proof of the unique position of the drug among antibacterial agents. The normal rate of hemoglobin regeneration is not surpassed and whole blood transfusion therapy is necessary.

The polymicrobial character of septic gunshot fractures has been defined in terms of putrid wound infection, staphylococcal infection, hemolytic streptococcal infection, and pyocyaneus infection. Staphylococci and streptococci are rapidly responsive to therapy. Anaerobic cellulitis due to the proteolytic bacteria of putrid wound infection responds to penicillin, but the bacteria may persist in the presence of devitalized tissue or wound exudates. Pyocyaneus is not susceptible to penicillin and is relatively unimportant as a single pathogen in the surgical management of the wound.

Penicillin therapy permits a direct and immediate surgical approach to the management of septic gunshot fractures. Its role in this regard is analogous to the use of vitamin K in patients with obstructive jaundice. Such a concept emphasizes the limitations of penicillin therapy and designates the supplemental position of penicillin in the over-all surgical program.

The untoward complications noted in this series of cases were limited to urticaria and other reactions suggesting an analogy to serum sickness. The reactions were transient, however, and there was no permanent sensitization, and no harmful effects of any significance were observed.



EXCESS STOCKS OF SUPPLIES

Because of the critical nature of certain items of medical supply, a determined attempt has been and is being made to have excess stocks returned to Medical Department depots. In many cases this attempt has been of little or no avail and visiting officers from the Office of The Surgeon General report that items of supply badly needed for overseas or new zone of interior installations are found in excess in many hospitals. Quinine (all forms) and atabrine have been especially critical because of the large demands for our troops fighting in malarious areas and for this reason an attempt has been made to reduce station stock to a minimum on these items. An officer recently returning from a visit to several southern stations reports that quantities of these drugs over and above authorized and needed levels were present at these stations.

It is not the intention or the desire of the Office of The Surgeon General to deprive any station of needed supplies. It must be borne in mind that The Surgeon General is charged with the health of the Army overseas as well as in the zone of the interior, and to accomplish this mission medical supplies must be available. The policy of hoarding or attempting to justify excess stocks cannot be condoned, when other installations, and especially units in actual combat, will be deprived of these stocks.

All Medical Department personnel are again urged to check carefully all stocks of medical supplies on hand, with special emphasis on quinine and atabrine and to arrange to report immediately all excess stock to the depot charged with supply of the installation.

• THE ARMY INDUSTRIAL HYGIENE LABORATORY

At Johns Hopkins University School of Hygiene and Public Health, Baltimore, the Army has established an Industrial Hygiene Laboratory which is a field installation of the Army Service Forces and is under the direction of The Surgeon General. The activities of the laboratory were outlined by the director, Lieut. Col. Raymond Hussey, in a paper read at a meeting of the Industrial Hygiene Foundation of America in Pittsburgh, 10 November 1943. The laboratory investigates equipment and materials used by the Army with reference to toxicologic considerations, investigates, in certain instances, the



industrial environment of privately-owned plants which have Army contracts, and applies preventive engineering-medical experience to maintaining safe and healthful working conditions for civilian employees in Army-owned and Army-operated industrial installations. The laboratory offers its services to all Army installations for the chemical analysis of materials with reference to the presence of toxic substances. The surveys of industrial plants consist of detailed observations of industrial processes and the use of field equipment to measure illumination. temperature, humidity, air velocity, and air contaminants. Atmospheric samples from plants are sent to the laboratory for analysis, and reports are made, together with recommendations, to the officers in charge of the installation and the industrial hygiene engineer. Degreasing operations constitute a major problem in industrial hygiene. This laboratory has encountered such common industrial hazards as lead, carbon monoxide, dusts, benzol, and solvent vapors, usually the chlorinated hydrocarbons, from degreasing operations. Among the hazards which have come to the attention of the laboratory are those associated with luminous dial painting in which radium is combined with zinc sulfide to make radium paint. A special investigation is being made of this subject. While there is a difference of opinion about the principal mode of entry of radium into the body, the trend of opinion at present is that it is by ingestion, and the most important measures to control this hazard consist of personal hygiene and good housekeeping. A part of the laboratory's work concerns materials and equipment. A great variety of substances has been considered for use by the Army because of the need of substitutes for materials made unavailable by the war; of these, Lieut. Col. Hussey mentions plastics, fumigants, insecticide powders, water repellents, mildew preventives, and synthetic rubber. An important part of the laboratory's work is the planning and designing of control equipment and the checking of plans for buildings which are to house hazardous operations. The laboratory makes frequent checks on surveys to determine what recommendations have been carried out. Various Federal agencies have given advice and consultation to the Army Industrial Hygiene Laboratory. Special mention is made of the U.S. Department of Agriculture, the U.S. Public Health Service, the Bureau of Entomology and Plant Quarantine, and the National Bureau of Standards.



ARMY SCHOOL OF MALARIOLOGY

An Army School of Malariology is to be opened at Panama early in 1944. This school represents the unification in a suitable location of various facilities which the Army has used heretofore for training a group of specialists. A great and expanding necessity for personnel trained in malaria control was the cause for specialized training courses which in the past have been conducted through the cooperation of the Tennessee Valley Authority, the Florida State Board of Health, the Rockefeller Foundation, and the Pan-American Highway Commission. The scattered location of the training areas has made instruction difficult and time-consuming. From the beginning, The Surgeon General's Office has wanted to coordinate these efforts, and it has now become possible to unify them in the Panama School. Under the command of Colonel Charles G. Souder, instruction will be given by a staff which has had wide experience in the control of malaria all over the world, both in peacetime and in the areas of present military operations. The men trained in Panama, together with the present Army malariologists, will form a group of specialists who will be valuable in both war and peace.

RUSSIAN SURGEONS ON THE LENINGRAD FRONT

Thousands of operations on Russian soldiers of the Leningrad front and on wounded civilians were performed by Russian surgeons under the most difficult conditions. Professor Ivan Vinogradov, an eminent Leningrad surgeon 70 years of age, himself chopped wood for the small portable iron stove with which the operating room of his hospital was heated. A Soviet airman whose intestines had been pierced in many places was operated on in an unheated hospital in midwinter. The patient had to be wrapped in blankets on the operating table. The surgeon and nurses wore fur coats under their gowns. The only light was from a kerosene lamp over which the surgeon held his hands to warm them before beginning to operate. The patient recovered to fight again. He was awarded the title "Hero of the Soviet Union." This is an example of the service which led to the decoration of more than one hundred Leningrad surgeons with the medal, "Defense of Leningrad."



HOSPITAL TRAIN—COMMUNICATIONS ZONE TYPE

A ten-car hospital train has recently been delivered to the Desert Training Center in California. It was furnished by the Transportation Corps in accordance with the requirements of the Medical Department. The manufacturer was Pullman-Standard Car Manufacturing Company, Worcester, Massachusetts.

This train is made up of six ward cars, one utility car, one officer personnel car, one orderly car, and one kitchen, dining, and pharmacy car. Each car is 44 feet long, mounted on two four-wheel trucks. The usual vestibules at each end of the car are omitted and two wide doors, one in the center of each side, are substituted to receive and discharge litter patients.

The ward car provides eight two-tier bunks, sanitary service facilities, medicine cabinet, and an ash tray and water glass receptacle at each bunk. A folding support is included to hold a litter for emergency use. Folding seats are provided in front of the entrance doors for use when doors are closed.

The utility car is provided with two Vapor Clarkson Steam Generators, and two 15-KVA Diesel electric generators. A shower bath and locker space are also included.

The officer personnel car serves as living quarters for four officers at one end and six nurses at the other. Shower, toilet, and locker space are provided for each group. A writing desk, water cooler, and folding seats are available for general use at the center of the car.

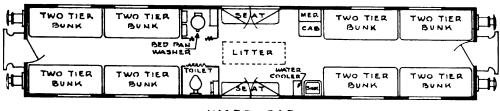
The orderly car bunks are the same as those in the ward car. However, the center area is provided with two toilets and lockers in lieu of the sanitary service facilities for patients.

The kitchen, dining, and pharmacy car combines a complete kitchen for the personnel and patients, dining table service for sixteen with two serving tables, and a small pharmacy complete with work table, sink, cabinets, and desk.

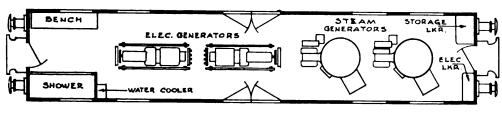
When used in the communications zone, a complete train would normally consist of twenty-two cars as follows: sixteen ward cars, one utility car, one officer personnel car, two orderly cars, one kitchen, dining, and pharmacy car, and one baggage car. The purpose of the present train is for training Medical Department personnel in the operation of hospital trains, communications zone type. It will be carefully observed for possible improvements to be incorporated into future units for overseas destinations.



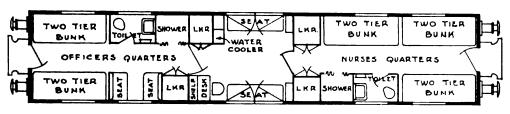
HOSPITAL TRAIN . COMMUNICATIONS ZONE TYPE FLOOR PLANS



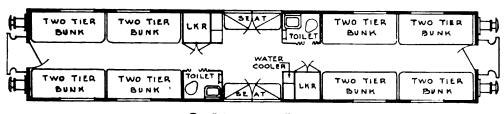
WARD CAR



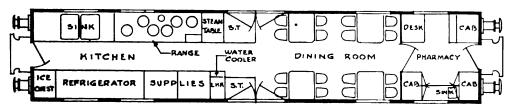
UTILITY CAR



OFFICER PERSONNEL CAR



ORDERLY CAR



KITCHEN DINING AND PHARMACY CAR



ONE THOUSAND WOMEN DIETITIANS NEEDED

To meet a critical need in Army hospitals overseas and in this country, 1,000 additional women dietitians will be required during the coming year to minister to the nutritional needs of the sick and wounded, the War Department announced on 16 November. Qualified women will be appointed in the Medical Department, Army Service Forces, in the relative rank of second lieutenant. At present, dietitians are serving in the commissioned ranks in nearly all the overseas theaters of operations. They are assigned to duty in evacuation hospitals, hospital ships, and wherever their services are needed.

Applicants for appointment must pass a physical examination, be less than 45 years of age, be at least 60 inches in height and weigh at least 105 pounds, and be citizens of the United States, the Philippine Islands, or of a co-belligerent or friendly country. A married applicant must not have dependent children under 14 and must agree to accept assignment unreservedly and to occupy available quarters at the station to which she is assigned. Educational requirements include a degree from an approved college with a major in foods and nutrition or institutional management. The applicant also must complete a dietitian's training course approved by The Surgeon General, except that under certain conditions two years of hospital experience may be substituted.

The Army has training courses for dietitians at Walter Reed General Hospital, Washington, D. C.; Brooke General Hospital, San Antonio, Texas; Fitzsimons General Hospital, Denver, Colorado; and Lawson General Hospital, Atlanta, Georgia. Appointees for these courses are selected from the United States Civil Service lists of eligibles. Students receive subsistence and a small salary. Many civilian hospitals are cooperating with the Army by offering training courses.

Appointment as Medical Department dietitian brings not only the relative rank of second lieutenant, but also the pay and privileges of Army officers of that grade, and overseas service adds a 10 percent increase in base pay. Information concerning appointments can be obtained by writing the field offices of the Officer Procurement Service in any one of thirtynine large cities in the United States.



GIANT WORMS IN KIDNEY OF DOG

Colonel Raymond Randall, V.C., Director of the Army Veterinary School, Army Medical Center, Washington, D. C., submits the following:

A Canadian dog that had been fed on fish was received in a consignment of 88 sled dogs at a camp in Colorado on 8 March 1943. The animal was admitted to the Veterinary Station Hospital on 8 April with a diagnosis of distemper and died on 4 May 1943. The station veterinarian at the postmortem examination found the following: general emaciation, chronic hemorrhagic enteritis, hypertrophy of the left kidney, and complete destruction of the right kidney except for the capsule which was indurated and distended; when opened the capsule was found to contain two coiled parasites, one 32 inches long, $\frac{3}{8}$ -inch in diameter, and weighing 46 grams, and the other 22 inches long, of the same diameter, and weighing 31 grams.

One of the parasites was submitted to the Army Veterinary School, Army Medical Center, Washington, D. C., for identification. On examination the specimen was found to be a female *Dioctophyme renalis* (Eustrongylus gigas).

Dioctophyme renalis, the only species of its genus, is the largest nematode known. The female measures up to 40 inches in length, and the male about one-third that size. The worms are blood-red. The eggs, many of which were present in the container, are barrel-shaped and the shells are pitted at the poles. They measure 71-84 by 46-52 microns.

This nematode occurs in various countries in the kidneys and other organs of the dog, fox, otter, beech marten, polecat, mink, weasel, other carnivora, and the seal; it has occasionally been found in the pig, horse, cattle, and man. Its usual habitat is the pelvis of the kidney, where it gradually destroys the renal tissue, leaving only the capsule. Usually only one kidney is affected, the right one being invaded much more frequently than the left. In the later stages of the disease, the much distended capsule contains only hemorrhagic fluid and one or more coiled worms. The worms may pass down the ureter into the bladder and out through the urethra. They are found infrequently in the abdominal cavity either free or encapsuled where they may cause a chronic peritonitis.

One kidney only is involved usually. When the strain on the other kidney becomes too great, renal symptoms may occur and a fatal uremia may result.



The life cycle of the parasite is not known, but there is evidence that the eggs passed in the urine of the host find their way to water, and there develop slowly from one to seven months before reaching full maturity. The larval stage occurs in fresh water fish, which accounts for cases like the one reported here in the dog.

Diagnosis can be made by finding the eggs in the urine if the parasites occur in the kidneys. Treatment other than attempted extirpation of the worm is unknown. The only prophylactic measure is the thorough cooking of the fish.

VENOMOUS FISHES

Venom is present in numerous and widely unrelated families of fishes. It may vary in quality from that comparable to the sting of a bee to that which causes death in man in one hour. The development of venom glands and specialized spines reaches its maximum in the large family of scorpion fishes, members of which occur in all tropical and temperate seas. In the colder parts of the north Atlantic and Pacific Oceans, they are large and valuable food fishes of much economic importance, such as the rose fish of the north Atlantic and the rock cod of our Pacific coast. In tropical waters the numerous species are much smaller and of no real commercial value, although all are edible. Their importance in the tropical Pacific lies in the fact that they are common on reefs and that some of them are highly dangerous to anyone working, wading, swimming, or fishing in such places. The head of a scorpion fish is always armed with hard, sharp spines on top and on the sides and usually around the eyes. A bony ring is present around the eye with a ridge running like a prop across the cheek toward its rear angle. In many kinds, the strong dorsal spines or the spines of the head are defense organs for injecting poison. Some tropical Pacific fishes of this group have spines as deadly as the fangs of a cobra. The pectoral fin is large and in some kinds is either fanlike or like a feathery plume.

The Most Dangerous

The lump fishes which are the most dangerous of venomous fishes are said to be "as deadly as Russell's viper." The warty lump fish occurs throughout the Indo-Pacific, and looks "for all the world" like a lump of stone or a part of the sea bottom. The thickset body has a large irregularly-shaped head



full of hollows and humps, and both body and head are covered with wart-like lumps. The whole fish is hideous. The first dorsal fin is low and seems to be only a little ridge of flesh and short flaps; in reality this ridge contains twelve sharp and strong spines with poison glands at the base and grooves to conduct the venom from gland to spine tip.

Lump fishes do not swim much, but lie on the bottom which they resemble exactly in color. They are commonly yellowish gray or blackish and often have flecks and patches of red or orange here and there. One must carefully watch for such fish when wading on a reef. It is best to carry a fish spear, or pointed bamboo, or even a long sharp pole when wading and to poke any suspicious looking object lying on the bottom.

Woe to him who tries to handle a living lump fish or steps squarely on the back of one. At the slightest touch each spine injects vemon, and agony follows immediately. Pain at the point of injury is followed by swelling. If the foot or hand is thus injured, shooting pains extend to the groin or armpit and the victim becomes violently ill. If a full charge of venom from the whole dorsal fin has been received, death may come in an hour or the victim may linger for hours in agony. There is no antidote to the venom of the lump fishes. The watchword, therefore, must be precaution.

The lump fishes reach a length of 12 to 15 inches and weigh 4 pounds and more. They are good eating, after the poison glands and spines are cut off. In Malaya, they are called "lepu," in the Philippines "lupo," and in Polynesia, "nofu." The two-fingered lump fish is much smaller and more slender and lives about rocks. It has a flattened head of monstrous shape, is mostly black, and inflicts very dangerous wounds with its dorsal fins.

Beautiful but Poisonous

Among the most beautiful of reef dwellers are the zebra fishes of which at least eight species are found in the tropical Pacific, all dreadful to touch when alive. The zebra fishes have twelve long spines in the first dorsal supplied with poison glands and, at the slightest touch, venom is injected, causing agony. Should one get a discharge from the whole battery of spines, it might cause a long illness or death in a few hours. They are brilliantly colored and they fear nothing. They swim about in sight of all with their deadly spines erect as if on



parade. One of the largest is the tandang, which is present all over the warmer areas of the Indian and Pacific oceans; it grows to be a foot long. The Kurran toombi reaches a length of almost a foot and a half, but does not get into the Pacific beyond the New Hebrides.

HEAD WOUNDS DUE TO MISSILES

In the Lancet of 21 August 1943, Major P. B. Ascroft analyzes the results of treatment of wounds of the head due to missiles in 516 cases in the Middle East. When only the scalp was wounded, no deaths occurred and 95 percent of the recovered patients returned to duty. When the skull was fractured but the dura was intact, the mortality rate was 1.5 percent and 85 percent of the recovered patients returned to duty. When the dura was pierced, the mortality rate was 15 percent and 55 percent of the recovered patients returned to duty.

Ascroft says that, if the patient can reach a fully equipped base hospital within forty-eight to seventy-hours after injury, one had better limit surgical treatment in forward areas to cutting away the hair around the wound, dusting the wound liberally with powdered sulfanilamide and fixing the first field dressing securely in position. If the patient cannot reach the base hospital within this period, the scalp around the wound is shaved widely, obviously devitalized scalp is cut away, all debris and dirt are removed, the wound is filled carefully with powdered sulfanilamide and left open, a protective dressing is applied and covered with a few turns of plaster bandage and the patient is evacuated as soon as possible to the base, where a complete operation should be performed without delay. In the preliminary operation, fractures without a hole in the bone are left untouched. If there is a hole in the bone, loose fragments of bone or metal visible within the dural tear or in the surface of the brain may be removed if this can be done without causing hemorrhage.

When the patient arrives at the base, roentgenograms are made. The state of consciousness is the most useful index for determining which of the seriously wounded patients should be operated on first.

Usually it is necessary to excise devitalized scalp more widely than in wounds of civilian life, since the deeper layers of the scalp often are destroyed more extensively than the outer layers. In cases of depressed or penetrating fractures



the loose fragments of bone are removed piecemeal rather than en bloc. In most cases, after excision of the fracture the diameter of the defect in the bone need not exceed 3 cm. Such a gap usually fills with firm fibrous tissue and causes little or no disability.

If the dura is intact, it is not opened at operation unless there are signs of cerebral compression. If it has been torn, nothing need be done to it except to cut away loose tags. In most penetrating wounds of the skull a shower of fragments of bone is driven through the dura into the brain. Since these are likely to produce abscess of the brain, they are removed; but deeply lying fragments of metal, which apparently have been sterilized by their own heat, are best left alone. The dura is not closed. A corrugated rubber drain is brought through a stab wound in the scalp. In the absence of gross sepsis the scalp is closed, but infected wounds are left open.

CARE OF DENTAL DIAMOND MOUNTED POINTS

Diamond points (Item 54532) should not be used in contact with metal, such as the excavation of old fillings, nor with heavy pressure at any time. The most efficient technique in using these points is to run them at high speed with a light touch and with sufficient water to carry away the tooth debris. When diamond points are clogged, they may be cleaned with a handbrush and soap and water, with rubber disks, or by rotating the moistened point at high speed for a few seconds against the enamel of an extracted tooth to which has been applied a small amount of moistened abrasive paste (Item 54230).

COURSES ON OUTDOOR LIVING

The success of camp life depends to a great degree on the extent to which individuals and groups can cooperate with nature, adapt themselves to unfamiliar environments, and win through to security. Dr. Walter P. Taylor, President of the Wildlife Society, in *Science*, 27 August 1943, points out that courses in outdoor living are being given at Cornell University, the University of Michigan, Syracuse University, the University of Missouri, Iowa State College, and at other places. These courses help to answer such questions as: how to proceed when lost in an unfamiliar country; what is available for food; and how to protect oneself against pests and diseases.



BULLET WOUNDS

The British War Office issued Army Medical Bulletin No. 22, 1943, which states that much devastation, involving the shattering of bone and extensive destruction of soft tissues, may be caused by an ordinary rifle bullet. At ranges below six hundred yards the bullet, to which a spinning movement is imparted by the grooves of the rifle barrel, tends to wobble, like a top, before settling down to steady flight. This increases the effect of impact, which is further magnified by another factor, centrifugal force, exerting at that stage its maximum disruptive effect. Such a wound, it is said, may therefore give the impression that it has been inflicted by an expanding or explosive bullet, or even by a shell splinter. At long ranges, when, although centrifugal force is diminished, wobble and other deviations of flight are increasing, lacerated and irregular wounds are again encountered, and spent bullets, or those which have ricochetted from rocks and stones, may produce wounds of similar or even more serious character. It is only at intermediate ranges that the classical picture, a neat round hole marking the entrance wound and a somewhat larger one the exit, can be observed. To illustrate the explosive effects at shorter ranges, experiments were conducted by firing a rifle bullet into a mass of clay. It was found that the bullet made a fairly sharp hole on entrance, passed on for a few inches, and then suddenly dispersed the clay to produce a cavity about a foot in diameter, the bullet itself breaking into fragments. After other factors had been excluded by further experiment, it seemed clear that these remarkable effects must be attributable to the centrifugal force of the bullet, conditioned by velocity, wobble, and spin.

On examination of a bullet wound the entrance can be identified by the fact that a zone of denuded epithelium always surrounds the orifice. An exit wound is free from signs of powder, and in most cases it is torn from within outward and larger in size than the bullet which caused it. Direction may be deduced from the relative positions of entrance wound, track, and exit wound. . . . When examining bullet wounds it must be remembered that two widely held assumptions are likely to be erroneous: (1) that an entry wound is always small and an exit wound always large; (2) that a large entry wound points to the use of explosive or dumdum bullets. With rifle or machine gun fire at close range a large entry wound is the rule.



PREPARATION FOR OVERSEAS MOVEMENT

The preparation of units, including detachments, for movement overseas has been a serious problem for unit commanders. While orders governing this important matter have been published in concise form in POM,* the numerous necessary details make it difficult for unit commanders to insure full compliance. Preparation for overseas movement has therefore frequently been inadequate.

In order to provide Medical Department officers with a means of checking on compliance with the provisions of POM, two charts originally prepared at the New Orleans Port of Embarkation are presented here with slight modifications. A unit check list for use with the charts is also presented. This was adapted from a list prepared by Headquarters, First Service Command. Subsequent changes in POM may require revision of these presentations.

The charts and the check list are intended to supplement POM and not, by any means, as a substitute for a careful study of that pamphlet. A list such as this necessarily can serve only as a reminder of things to be done, and as a test by means of which the responsible officer may determine that his responsibility has been discharged. All unit officers should become familiar with POM, as they are responsible for complying with its provisions, even though other officers may be responsible for the unit as a whole. Officers must also examine carefully the movement order for the particular unit. A movement order supersedes POM to the extent, and only to the extent, that one or more provisions of the latter are specifically excepted.

The unit commander should complete all possible steps, indicated in POM as routine, prior to receipt of the warning order. Matters left to be completed at the port of embarkation must be kept at a minimum. In section VIII, POM, will be found the responsibilities of all commands and chiefs of services.

Brief explanatory notes on entries to be made on the Processing Chart for Enlisted Men appear with chart 2. These notes for the most part apply to corresponding columns on the preceding chart. Chart 2 includes items which do not require a check on each individual but apply to the unit as a whole.

^{*}File Reference: Preparation for Overseas Movement, Short title POM, 2d Edition, AG 370.5 (12 July 1943) OB-S-E-GN-AF-SPMOT-M, dated 1 August 1943.



CHART 1

Processing chart in preparation for

	1.	2	3	4	5	6	7	8	9	10	11	12
No.	Name	Rank	Branch	Army serial number	W.D. A.G.O. Form No. 65-4	W.D. A.G.O. Form No. 77	M.D. Form No. 81	Identification tags	W.D. A.G.O. Form No. 66-1	Spectacles required	Spectacles possesses	Prescription for glasses
1 2 3		1	1		İ							
2					1							
Etc.		1		1	1							

CHART 2

Processing chart in preparation for

	1	2	3	4	5	6	7	8	9	10	11	12	13	14		15		16		17		18	19
No.	Name	Army serial number	Rank	Specification serial number	Classification	Age	Blood type	Spectacles	Spectacles possesses	Spectacles on requisition	Spectacle prescription	Dental classification	Smallpox vaccination	Smallpox - additional	in	phecocitio	n	Typhoid - additional	Te	tan 2d		Tetanus - additional	Yellow fever
1		'		1	-	1		1	02	1	1		02	0,	1	1	1		1	-	Jul	1	1
2 1		1	1	1	1		1	1	-	-	1	1	1	-		-	-	1	1	1		+	-
2		i	1	1	1				I	1	1	1	1	1	1		-	1	1			+	1
Etc.		1	1	1	1	1	1	1	1	1	Í	İ			1		İ	i	1	1	1	1	1

CHART 1

for officers overseas movement

13	3 14 15 16			_	17	18			19	20	21	22		2	3		24	25	26	27	28	29	30	31	
Dental classification	Smallpox vaccination	Smallpox additional	Typhoid inoculation		Typhoid additional	Te	Tetanus		Tetanus additional	lera	ow fever	nus	Allotments and deductions				unt of insurance	W.D. A.G.O. Form No. 43	tor cards	. A.G.O. Forms No. 971, No. 204	Final type physical	Infiltration course	Gas chamber CN.	chamber Cl.	
Den	Sma	Sma	1st	2d	3d	Typ	1st 2	2d	3d		Cholera	Yellow	Typhus	В	D	Е	N	Amount	W.D.	Locator	W.D.	Fina	Infilt	Gas	Gas c

CHART 2

for enlisted men overseas movement

20	21	22	23	24	25	26	27	28	29	30		_	31	_	32	33	34	35	36	37	38	39	40	41	42	43	44	45	4
Cholera	Typhus .	Identification tags	W.D. A.G.O. Form No. 43	W.D. A.G.O. Form No. 28	W.D. A.G.O. Form No. 20	W.D. A.G.O. Form No. 24	Locator cards	W.D. A.G.O. Forms No. 971, No. 204	Citizen	Marital status	đe	adu	ndiet	nen lion	Amount of insurance	Personal affairs	Infiltration course	Gas chamber - CN.	Gas chamber - Cl.	Final type physical	Basic training	Technical training	W.D. A.G.O. Form No. 32	Clothing and equip, marked	Articles of War	Sex morality	Sec. VIII, AR 380-5	Last paid	Fireloner

EXPLANATION OF CHART 2

The columns in chart 2 are numbered to correspond with the following paragraphs:

- 1. NAME. In this space enter last name, first name, and middle initial. Indicate by an asterisk conscientious objectors.
 - 2. ARMY SERIAL NUMBER.
 - 3. RANK. Enter in pencil to facilitate necessary changes.
 - 4. SPECIFICATION SERIAL NUMBER.
- 5. CLASSIFICATION. Here enter AGCT (Army General Classification Test) class.
 - 6. AGE. To nearest birthday.
- 7. BLOOD TYPE. Enter the type only after entry has been made in the service record (W.D. A.G.O. Form 24), immunization register (M.D. Form 81), and identification tags.
- 8. SPECTACLES. Enter "Yes" or "No," depending on the individual's need for correction. (POM, par. 9b(5))
 - 9. POSSESSES. Enter number of spectacles in individual's possession.
 - 10. SPECTACLES ON REQUISITION. Enter in pencil.
- 11. SPECTACLE PRESCRIPTION. Enter "Yes" only if the prescription has been placed in the service record and the enlisted man has a copy in his possession.
- 12. DENTAL CLASSIFICATION. Enter I, II, III, or IV in pencil. Correction will be made of all Class I dental cases and Class II if possible. (POM, par. 9b(6))
- 13. SMALLPOX. Enter date of original Army vaccination. (POM, par. 9b(3)(a))
- 14. ADDITIONAL SMALLPOX. Enter dates of subsequent vaccination appearing on immunization register. The last vaccination must have been within the preceding year.
- 15. TYPHOID. Enter dates of last series of three doses. (POM, par. 9b(3)(a))
- 16. ADDITIONAL TYPHOID. Enter dates of stimulating doses, the last of which must have been within the preceding year.
- 17. TETANUS. Enter dates of the last series of three doses. (POM, par. 9b(3)(b))
- 18. ADDITIONAL TETANUS. Enter dates of stimulating doses. The last stimulating dose must have been given within the preceding six months.
- 19. YELLOW FEVER. Enter date of last inoculation. Individual will be inoculated only if movement orders so specify. (POM, par. 9b(4))
 - 20. CHOLERA. Same as column 19.
 - 21. TYPHUS. Same as column 19.
- 22. IDENTIFICATION TAGS. Enter "Yes" or "No" in pencil depending on whether the tags are complete.
- 23. W.D. A.G.O. FORM NO. 43. Enter "Yes" only when the emergency addressee and personal property cards are complete. (This form should not be considered complete until class E and F allotments are entered on the back.)
 - 24. W.D. A.G.O. FORM NO. 28. Enter "Yes" if complete.
- 25. W.D. A.G.O. FORM NO 20. Enter "Yes" if complete. The information on this form should include AGCT score, specialist rating, completion of infiltration course or other special courses, special service schools attended, and other information required.



- 26. W.D. A.G.O. FORM NO. 24. Enter "Yes" if complete (common omissions—shoe size, gas mask size, Army specialty, dentures, blood type, spectacle prescription, readings of Articles of War, issuance of FM 21-100 and W.D. A.G.O. Form No. 28, furloughs, insurance, class F deductions).
- 27. LOCATOR CARDS. Enter "Yes" when one for filing by grade and one for filing alphabetically are received. (POM, par. 35c)
- 28. W.D. A.G.O. FORMS NO. 971 and 204. Enter "Yes" when two forms No. 971 (V Mail Form) and one form No. 204 (Notice of change of address) have been completed. (POM, par. 18)
- 29. CITIZEN. Enter "Yes" or "No" (If "No," enter in pencil). (W.D. Cir. 193, 1943)
- 30. MARITAL STATUS. Enter in pencil whether married, single, divorced, or widower.
 - 31. ALLOTMENTS AND DEDUCTIONS. Enter amounts in pencil.
- 32. AMOUNT OF INSURANCE. Enter in pencil unless ten thousand dollars (\$10,000). The provisions of the National Service Life Insurance Act as amended must have been explained to all personnel. (POM, par. 43c; W.D. Cir. 7, 1942)
- 33. PERSONAL AFFAIRS. Enter "Yes" if the personnel officer is satisfied that all personnel have been advised of the desirability of making allotments to dependents and the advantages of making a will, power of attorney, or transfer of title. (POM, pars. 34b and d)
- 34. INFILTRATION COURSE. Enter "Yes" when the individual has completed a mental conditioning course under close overhead fire and this has been entered in W.D. A.G.O. Form No. 20.
 - 35. GAS CHAMBER CN. Enter date completed.
 - 36. GAS CHAMBER Cl. Enter date completed. (W.D. Cir. No. 75, 1943)
- 37. FINAL TYPE PHYSICAL. Enter "Yes" when completed and it has been determined that the individual is physically and mentally qualified for overseas duty. The staging area or port of embarkation is not responsible for physical examinations. (POM, par. 9, W.D. Cir. 85, 1943)
- 38. BASIC TRAINING. Enter "Yes" if MTP (Mobilization Training Program) 8-1 or 8-5 has been completed.
- 39. TECHNICAL TRAINING. Enter MOS (military occupational specialty) of position for which technical training has qualified the individual.
 - 40. W.D. A.G.O. FORM NO. 82. Enter. "Yes" if up to date and complete.
 - 41. CLOTHING AND EQUIPMENT MARKED. Enter "Yes" when completed.
 - 42. ARTICLES OF WAR. Enter in pencil the date of last reading.
 - 43. SEX MORALITY. Enter in pencil the date of last reading.
- 44. SECTION VIII, AR 380-5. Enter "Yes" when the individual has been acquainted with the provisions of this section. (POM, par. 13a)
- 45. LAST PAID. Enter date last paid. Each individual must be paid through the pay day immediately preceding movement. (W.D. Cir. 201, 1943)
- 46. FURLOUGH. Enter "Yes" if the individual has had furlough within the six months immediately preceding movement. (POM, par. 9e)

UNIT CHECK LIST

- 1. Have all personnel ineligible for overseas duty been eliminated? (POM, par. 9e)
- 2. Have records of individuals not accompanying the unit overseas been withdrawn and properly disposed of? (POM, pars. 9c and 44w)
- 3. Have extract copies of classified movement orders been prepared for unit personnel section? (POM, par. 35c(1))
- 4. Has an officer been made responsible for classified correspondence and other material?



- 5. Has every individual been warned against communicating with anyone during unit's movement to the staging area or port of embarkation? (POM, par. 13d)
- 6. Has a unit censor been designated and have all personnel been acquainted with censorship regulations? (POM, par. 16; W.D. Training Circular 66, 1943, par. 2; Pamphlet 21-1)
- 7. Has an officer or senior noncommissioned officer been designated as a representative for intelligence? (POM, par. 17)
- 8. Have all personnel been instructed in correct procedure for receiving and sending mail overseas? (POM, par. 18)
- 9. Have all personnel been instructed that personal effects which are not to be taken overseas will not be taken to the port of embarkation?
- 10. Have arrangements been made to dispose of unit fund-owned property and the funds converted into U. S. Postal Money Orders or U. S. Treasury checks (other than reasonable amounts of cash or funds turned into Government bonds)? (POM, pars. 31 and 32)
- 11. Have all steps been taken to fill unit to necessary strength with personnel qualified for overseas service? (POM, pars. 9f, 30a, 37b, 40, 43g)
- 12. Is unit supplied with proper T/O, T/E and/or T/BA, or a Special List of Equipment? (POM, par. 29)
- 13. Based on inspection, has list of "Showdown Shortages" been compiled separately for each service (Q.M., Ord. etc.) so as to show: (a) number authorized (use Form 412 as a guide); (b) number on hand, fully combat serviceable or which can be made combat serviceable at the station; (c) number unserviceable; (d) "Showdown Shortages"; and has the list, properly signed, been submitted to the station commander in lieu of a requisition? (POM, par. 10c)
- 14. Has POM, pars. 30d and e, been studied carefully to determine what items will not be taken from home stations and will not be reported as shortages?
- 15. Have all such vehicles listed in POM, par. 441(2), been turned in to home station?
- 16. On receipt of movement order, have provisions of POM, par. 441, been complied with? (Report on all vehicles accompanying the unit)
- 17. Has request been made to station commander for services of service command packing squad? (POM, par. 11a)
- 18. Has all organizational and personal equipment been properly marked and packed? (POM, pars. 11 and 12)
- 19. Has every precaution been taken to see that no explosives or inflammable materials have been packed or shipped with organizational equipment as freight or baggage?
- 20. Have all officers and enlisted men been told of minimum number of items to carry on board for use during the voyage? (POM, par. 27)
- 21. Have all officers been warned not to carry prohibited articles in their personal baggage? (See AR 55-410 and AR 55-470)
 - 22. Have packing lists been prepared for each container? (POM, par. 11h)
- 23. Has W.D. Cir. 218, 18 September 1943, been studied and acted on regarding disposition of recreational equipment owned by organizations or individuals? The circular states that they may be taken along under certain conditions.



Correspondence

ADMINISTERING PLASMA IN A FOXHOLE

Dear General Kirk:

An instance which I observed may be of interest as it serves to illustrate the splendid work of your corpsmen. Blood plasma was being administered to a badly wounded man in an improvised aid station hastily set up in a small native shack in the jungle. The container was suspended from a nail in an upright. Another wave of dive bombers suddenly came in. Under supervision of the surgeon, two soldiers grasped the litter while a medical corpsman secured the plasma container. Quickly but gently the wounded man was carried to a nearby foxhole large enough for the litter. While nearly everyone flattened out as he heard the swish of a big bomb, the aid man stood erect holding up the container to insure the continued flow of the life-restoring fluid.

The 500-pound bomb hit some fifty yards away, but the dense jungle protected the aid man from injury although a fragment went through a water can less than ten feet away. Our battalion aid men are always there when the going is tough and they hold a warm spot in the regard of all the fighting doughboys. The young surgeons, also, are playing the game in fine style, muddy, bewhiskered, and sleeping as well as they can on the ground along with the others in the advanced combat areas. I believe, also, your Department is doing a good job in getting its supplies and equipment where they are most needed.

Colonel....., c/o Postmaster, San Francisco, Calif.

TRIBUTE TO U. S. ARMY NURSES

Extract from a letter written by Senator Brewster to Senator Truman concerning the visit by five Senators to the war fronts, published in the Congressional Record, Washington, D. C., 1 November 1943, p. 9018.

Everywhere American troops were found there were splendidly equipped hospitals to care for their well-being with trained nurses in attendance who have volunteered for service anywhere. We saw these girls carrying on under all manner of conditions, from the quonset huts of Iceland where 2 feet of rocks were piled beside their rounded metal roofs to anchor the buildings from being blown away by the terrific gales, on down to the bamboo huts of the tropics, where the temperature outside was 160° above zero. Always the atmosphere was cheerful, and every comfort humanly possible was being afforded the boys in their care. These nurses have now become literally "Angels of Light" as we saw them flying to the



combat areas to bring back boys who needed immediate attention. We saw these boys on the operating table 200 miles behind the front within five hours after they were wounded.

These observations may come with some measure of reassurance to the mothers of America that every human care is being taken to look out for their sons.

AT THE FORWARD ECHELON IN CHINA

The following letter, written by a medical officer serving in China, was addressed to an officer in The Surgeon General's Office.

Our boys have been treating Tojo's boys a bit rough, and we expect them to visit us en masse any time. Dr. ---- sent me a new book on hormones and I am reading a chapter each week to the local medical group. The last medical meeting was held in the Mission. In the back country the first person you meet on entering a village is a missionary. I was poled and sculled across the river in a sampan by a lad of about eight years so thin that I wondered how body and soul stayed together. His sculling was perfect. Walking up long steps worn deep through the centuries, I passed through narrow streets and by the guard at the gate of the Mission to a place at the dinner table. The evening was stifling. After dinner I lectured to about 50. It is difficult to speak before such a group. Although most of them understand English, one must choose his words with great care and talk very slowly. Three hours later you shake hands, bow to each one present, and leave. The entire group escorts you to the river and argues with the boatman about the charge for crossing. The Chinese medicos ask, "Where and how can I go to the States for special training?" I did a radical Wertheim several days ago for Ca of the cervix.

State-side food and some PX supplies would be gifts from heaven out here. It is surprising the lift in morale on the occasions when we had state-side cheese. Being so far out on the end of the line recreational facilities are practically nonexistent.

This would be an excellent spot for one just out of his intern year.



Special Articles

Army Splints

MAJOR GENERAL NORMAN T. KIRK

United States Army

COLONEL LEONARD T. PETERSON Medical Corps, United States Army

The various splints manufactured in the Orthopedic Shop of Walter Reed General Hospital since 1919 are described herein. These splints have been used for this period of time by the Orthopedic Section of this hospital and have been found highly satisfactory. Certain improvements in their construction have occurred over this period. It is felt that a detailed description of their manufacture may be of aid to the various orthopedic shops established in our Medical ISCHIAL CALIPER

Department hospitals:

· THE ISCHIAL CALIPER

Material.

Quarter-inch cold rolled steel rod.

Surgical steel, flat $\frac{5}{8}$ inch by $\frac{3}{16}$ inch.

Flat aluminum or galvanized iron, gage 18, sheets.

Flat band, soft steel, 1 inch by ½ inch, in lengths.

Iron and copper rivets.
Leather, russet jacket,
for cuffs (square foot)
Straps of calfskin, russet leather, medium,
⁵/₈ inch.

Buckles, nickel, 5/8 inch.

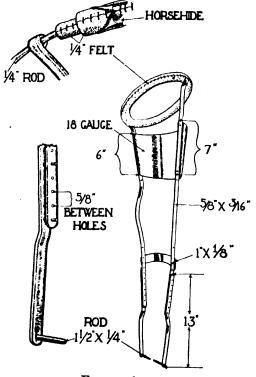


FIGURE 1a

Felt, saddle, 1/4 inch (furnished in 1/2 inch or 1/4 inch).

In view of the demand for reprints, this article is republished from the Army Medical Bulletin of October 1942. The authors at that time were chief of the surgical service and chief of the orthopedic section, respectively, at Walter Reed General Hospital.

Irish linen thread, 6-cord, or substitute.

Horsehide, cream color, light.

Steel tubing, 1/4 inch inside diameter, for heel plate.

Shoe eyelets, celluloid, AA, cordovan.

Shoe laces, cordovan.

Measurements. Length from tuberosity of the ischium to the bottom of the heel. Measurements for the outside rod are from $2\frac{1}{2}$ to 3 inches longer than the inside.

Measurements for the ring are taken at the level of the ischium, mesially and around the crease of the buttock, to where it crosses the great trochanter, and approximately one inch is added to those measurements to allow for padding which is placed over the iron ring.

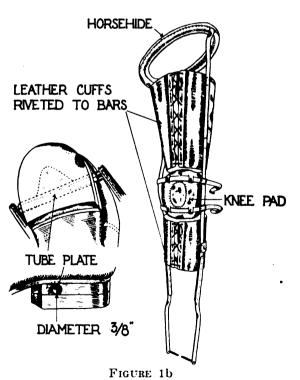
Measurements are then taken for the leather and metal cuffs and bands to support the thigh and leg and for the knee pad.

The leg is extended on a table, and a tracing is made to show its contours as a guide to molding the lateral bars.

Construction. The bars are each of two parts, the upper part extending from the ring to just above the ankle. These are cut to proper length and are bent cold to conform to the curves of the leg. The lower ends are drilled with a ½-inch drill for the attachment of the lower extension assembly.

The cold rolled ¼-inch steel rod is cut one inch longer than the measurements and is properly shaped to fit the thigh and buttock and to form a secure ischial "seat." It will be more triangular than round when properly formed. The upper ends of the two lat-

ISCHIAL CALIPER

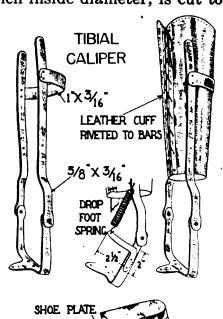


eral bars are heated in a furnace, flattened, and are secured to the ring of the caliper while hot, by welding, or are braised to the ring, and the ring ends are braised together under the outer bar. The extension pieces of each bar having been shaped cold to fit the leg, the lower ends are drilled and ¼-inch rod is braised into these holes, and it is then fitted into the tube in the heel of the shoe. They are then secured by rivets to the upper assembly of the side bars to give the length of splint desired.

Adjustments can be made as to length during measurements and fitting. The metal bands are now secured to the splint by welding or riveting after they have been molded or formed to fit the thigh and leg. The leg band should strike the maximum curve of the calf muscle. The felt is now cut, molded, and sewed to the ring in two layers as indicated in the drawing. This is then covered with horsehide and sewed with Irish linen thread, 6-cord. The leather cuffs are adjusted to fit the thigh and leg, eyelets are placed, and then fixed by copper rivets to the side bars of the splint. A piece of steel tubing, ½ inch inside diameter, is cut to

proper length for the heel assembly and is braised to flat metal to secure it to the heel of the shoe, as shown in diagram. This tube is set at such an angle in the shoe that the patient's foot will be in the same degree of abduction or adduction as the opposite foot.

This is the only brace that is completely weight bearing for the lower extremity. It must be made of rigid surgical steel so that there will be no wobble when it is assembled. It should not contain any knee device to permit knee bending. Even if a drop lock is used, the patient is liable to cheat and full weight bearing be prevented. Lighter material than required by specifications regarding steel will





not be satisfactory. When the patient is fitted with this splint, no weight is borne on the patient's heel, and it should lie \(\frac{1}{8} \) to \(\frac{1}{4} \) inch above the sole of the shoe, the full body weight being borne on the tuberosity of the ischium. If the tuberosity of the ischium rides above the ring, the ischial ring is too small; if the tuberosity of the ischium rides inside the ring, the ring is too large. In either case it should be adjusted.

TIBIAL CALIPER

Material. The metal, leather, and rivets used in this splint are similar to those used in the ischial caliper. Light metal may be used as the brace is not weight bearing.

Measurements.. The top measurements are taken $\frac{3}{4}$ inch below the head of the fibula.

Construction. The ankle joint is placed at the level of the tip of the external malleolus, and the foot piece is secured to the two leg bars by iron rivets. For the attachment of the splint to the sole of the shoe just in front of the heel, a piece of steel of the same size is braised to the metal stirrup which crosses the sole of the foot. When a drop-foot splint is needed in addition to the tibial caliper, a coiled spring made out of 14-gage spring wire is fixed by rivets on the outer stirrup of the brace, as indicated in the drawing.

MODIFIED

TAYLOR BACK BRACE

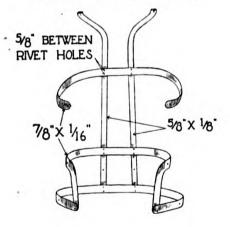




FIGURE 3a

MODIFIED TAYLOR BACK BR

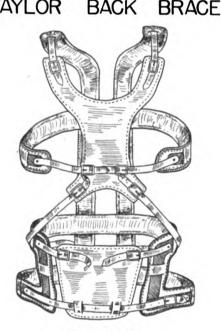


FIGURE 3b

The tibial caliper is used to support convalescent fractures of the bones of the leg and as a support to prevent fracture in a tibia after the removal of a bone graft. This is not a weight-bearing splint.

The leather cuff is prepared of russet jacket leather and is molded to fit a cast of the leg or a standard wooden model simulating a similarly shaped leg, and, after the eyelets are placed, the cuff is secured to the metal frame by rivets.

TAYLOR BACK BRACE

This is used for convalescent support of fractures of the spine below the seventh dorsal level.

Material. Black tempered spring steel, $\frac{7}{8}$ by $\frac{1}{16}$ inch. The uprights of the splint are of surgical steel, $\frac{5}{8}$ by $\frac{1}{8}$ inch. Calfskin. Horsehide, for inside lining of brace. Felt, $\frac{1}{8}$ inch. Rivets, $\frac{5}{8}$ inch.

Measurements. Measurements are taken from the vertebral prominence or the first dorsal to the tip of the coccyx.

The brace is made according to measurements of the individual case. Some bracemakers pour a mold of plaster and fit the metal parts to this mold. To get proper angles and curves, lead strips may be used to give the necessary curves and contours, and this, supplemented by proper measurements, ordinarily suffices.

Construction. Spring steel strips are cut to proper length, are heated and shaped according to 1/32 THICK form, are drilled and temporarily riveted, fitted to the patient, and adjusted. The brace is then taken down, retempered, and reassembled. The metal parts which come in contact with the skin are covered with 1/8-inch felt and over this is placed cream horsehide and, on the outer part of the metal, calfskin. This is all held together by stitching which may be machine sewed, as illustrated in the drawing. The covering of the metal parts may be done in sections before assembling to facilitate its padding. The chest section is cut to fit, is made of calfskin, lined with horsehide, and padded at the ends where pressure is borne over the clavicle, and 5/8inch buckles and straps are fixed

THOMAS COLLAR

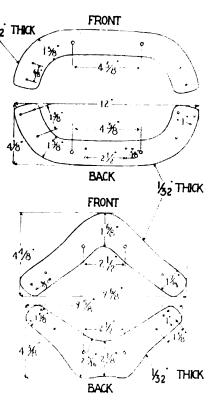


FIGURE 4a

to secure it, as indicated in the drawing. The abdominal pad is made of calfskin, reinforced for rigidity with a piece of pressboard cut to form, lined with horsehide, and secured with buckles and straps to the pelvic assembly.

THOMAS COLLAR

This collar is used for the convalescent care of fractures and dislocations of the cervical spine and fractures of the vertebral bodies above the region of the sixth dorsal.

Material and construction. The assemblage forming the chin, occipital, and chest plate is made of German silver, 20-gage, or substitute which can be similarly worked. It is padded with ½-inch felt, tapered and molded as indicated, covered with moleskin cloth and sutured as

THOMAS COLLAR

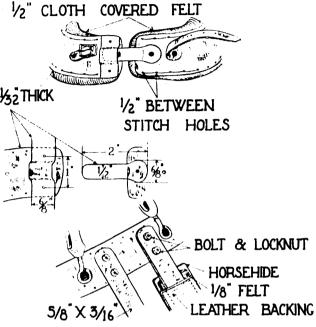


FIGURE 4b

THOMAS COLLAR

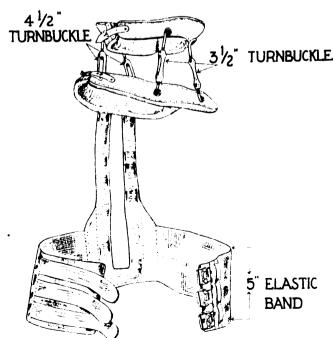


FIGURE 4c

illustrated, to the holes in the metal frame;

3/8-inch buckles and straps are used. Both

TURNBUCKLE the occipital and chin pieces are locked together with a metal flange and clamp made of the same material.

Galvanized i r o n commercial turn-buckles, 4½-inch, are used posteriorly and 3½-inch ones anteriorly, to support the occipital and chin rest on the chest plate. They are secured by rivets to the occipital-chin plate and by riveting and

soldering to the chest plate. The Thomas collar is then secured to two metal upright bars which extend to the lumbosacral spine and are then joined together with a tranverse piece of similar metal, riveted to make it rigid, and then padded with \(\frac{1}{28} \)-inch felt and covered with horsehide and calfskin backing. Then a 5-inch elastic webbing of sufficient length is attached thereto, and this is secured around the abdomen with three 1-inch buckles and webbing strap.

WIRE DROP FOOT SPLINT

A wire drop-foot splint is used in cases of drop foot. It is simply constructed, is light in weight, and is extremely efficient.

Material and construction. This splint aff is made of 8-gage music wire. The only objection to this splint is that this type wire bends and may need replacement. The wire coil is formed by bending the wire around a rod of 1 inch diameter. The foot attachment is worked cold with bending irons and pliers and is secured to the sole of the shoe with 2-point tacks. It is se-8 CAUCE MUSICAL cured to the front of the heel by a strip of 3/8- by 1/8-inch metal, as illustrated. The wire extends upward on the leg to support the 3-inch leather cuff which rides posteriorly over the middle of the calf muscle. The upper ends of the wire are bent on

themselves to form a knob. This fits into

WIRE DROP **FOOT**

SPLINT



3/8 X 1/8

FIGURE 5

a sleeve fashioned by sewing the anterior edges of the leather cuff, and the leather cuff is held in position around the front of the leg by a 1-inch webbing strap.

T SPLINT FOR FRACTURED CLAVICLE

Material.

Wood - maple or hickory, 3 by 18 inches, two pieces.

Buckles for $1\frac{1}{2}$ -inch webbing.

Felt, saddle, gray.

Stockinette, 3-inch.

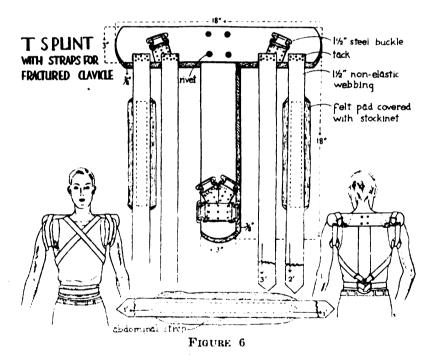
Webbing, 1½-inch.

Carpet tacks.

Rivets or screws.

Construction. The "T" is framed by mortising and fixing with rivets or screws the end of one piece of the wood with the middle of the other. Straps and buckles are secured to the wooden T splint by carpet tacks, as indicated. Padding of saddle felt covered with stockinette may be sewed to the straps which cause pressure under the axilla and to the abdominal strap, or gauze cotton pads may be used, being pinned to the straps, using safety pins. These dimensions of the "T" are used for the average patient. Larger, 20-inch, and smaller, 16-inch, splints should be made up and available. For infants and young children T splints are made from basswood splint board, tacked together, padded, and fixed to the child with bandages and adhesive.

Application. In fractures of the clavicle the shoulder drops downward, forward, and inward. The proximal fragment is usually pulled slightly anterior and upward. The splint is padded with saddle felt, or gauze cotton pads, held in place by adhesive. Traction is made upward, outward, and backward on the shoulder to reduce the fracture. The splint is applied to maintain immobi-



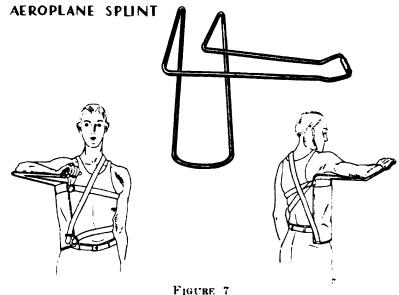
lization. The inner strap on each side is brought up under the splint and over the shoulder at the base of the neck of the patient, crossed over the chest, and secured to the two upper buckles on the lower end of the vertical arm of the splint. The abdominal strap is applied. Both shoulders are now pulled upward, backward, and outward by the axillary strap and fixed in this position. Straps are adjusted daily and skin under splint cared for.



AEROPLANE OR ABDUCTION SPLINT

Material.

Buckle, $1\frac{1}{2}$ inch, two-prong. Rod, 1/4-inch steel, Bessemer or cold rolled. Sheet aluminum, 16-gage. Webbing, 1½-inch, gray, nonelastic.



Measurements.

Width of lower end of splint, average 7 inches, convex curve. Distance from A (just below anterior superior spine of ilium) to anterior axillary fold.

Length of arm, measured from anterior axillary fold to flexed elbow, arm in abduction.

Length of forearm, measured from flexed elbow to middle of palm of hand.

Line across palm, average 3 inches.

Construction. The 1/4-inch steel rod is bent cold (easily accomplished by use of vise and hammer). Rod is joined and fixed under hand piece by fixing ends of rod in an aluminum cylinder, formed from a piece of aluminum $\frac{7}{8}$ by $2\frac{1}{2}$ inches, which is fashioned around a 1/4-inch steel rod using a vise and hammer. Three nonelastic webbing straps and buckles are attached to splint by sewing, as illustrated. Canvas is sewed over the metal bars of the splint, forming a hammock which supports the splint against the pelvis and chest wall and the arm and forearm on the splint. Gauze cotton pads are added,

as indicated. A bias muslin bandage (item 20090) may be used in lieu of canvas. The arm and forearm may be secured to the splint by a bias muslin bandage.

Uses.

- 1. Brachial plexus injuries.
- 2. Paralysis or weakness of abductor CLAVICLE SPLINT muscles of shoulder.
- 3. Shoulder joint injuries (other than dislocations).
- 4. Fractures of the scapula. Surgical and anatomical neck of the humerus. Convalescent fractures of the shaft of the humerus.
 - 5. Subacromial bursitis.
 - 6. Acromial, clavicular dislocations.

CRUTCH SPLINT FOR FRACTURED CLAVICLE Material.

Cold rolled steel rod, 1/4-inch.

Iron rivets, 1/8-inch.

Buckles, nickel, 1-inch.

Webbing, 1-inch.

Felt, saddle, 1/2-inch.

Leather, horsehide.

Canvas.

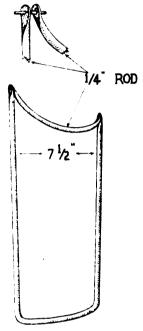
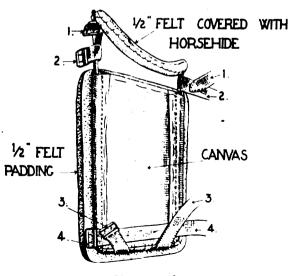


FIGURE 8a

CLAVICLE SPLINT

CLAVICLE SPLINT





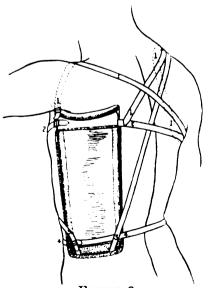


FIGURE 8c

Construction. The cold rolled steel rod is shaped to extend from below the iliac crest to the axilla and is $2\frac{1}{2}$ inches higher in front. The crutch ring is fitted to the uprights with steel rivets. Canvas is sewed to fit the upright rods and is covered on the inner aspect with $\frac{1}{2}$ -inch felt. Straps and buckles are attached according to the illustrations. The felt may be covered with clean stockinette for each application. The crutch ring is constructed with two layers of $\frac{1}{4}$ -inch felt and horsehide, as illustrated.

Application and use. The splint is designed to hold the affected shoulder out, up, and back. The diagonal strap (No. 3) holds the splint up, while two horizontal straps (No. 2 and No.

- 4) hold this splint to the body and the "figure-of-8" strap (No.
- 1) holds the affected shoulder back.

ARCH SUPPORTS

Material.

Sponge rubber, 12-inch (felt in lieu of rubber).

Leather: calfskin, horsehide.

Pressboard.

Construction. struction may be varied for longitudinal, metatarsal, or combination arch supports. Measurements are taken from the back of the heel to 1/4 inch behind the metatarsal heads. Calfskin designed for the top is cut according to pattern as illustrated. The sponge rubber is cut and buffed on the sanding wheel to the desired size. The metatarsal pad is cut and is cemented to the calf-

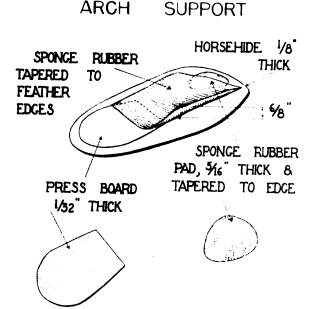


FIGURE 9

skin after which the longitudinal support is attached. The pressboard for the heel is finally cemented in place. The underside is covered with horsehide which is sewed to the calfskin.

(Photographs, $8" \times 10"$, from which these illustrations were made, may be obtained on request from the Army Medical Museum.)

The Re-evaluation of Sulfa Drugs

MAJOR CHAMP LYONS Medical Corps, Army of the United States

Military surgeons as a group have a broad general knowledge of sulfonamide therapy. The purpose of this report is to define general trends and current opinion regarding certain controversial aspects of the problem as they appear to a surgeon in a general hospital receiving casualties from overseas. The subject matter for discussion has been selected on the basis of questions asked by medical officers assigned for training in the care of infected wounds. The questions are: (1) What toxic complications are important? (2) What new sulfonamides are being developed and how do they differ from standard drugs? (3) What is the drug of choice for local sulfonamide therapy? (4) How successful is prophylactic sulfonamide therapy in traumatic wounds?

TOXIC REACTIONS

During the last few years, physicians have learned to work within the toxic limitations of the sulfonamides. Skin rashes are common but rarely dangerous. Agranulocytosis is a rare but serious complication. Renal or ureteral obstruction is fairly frequent, particularly in hot climates, and may be serious if not treated promptly. Pathologic examination of tissue from treated patients and experimental animals has demonstrated that the sulfonamides may produce a necrotizing injury to the vascular endothelium and secondary areas of focal necrosis in the parenchyma of the brain, heart, liver, lungs, spleen, lymph nodes, and adrenal glands. The focal necroses are rarely apparent clinically, but awareness of the possibility of such damage may lead to improved recognition of these complications.

Sulfaguanidine and succinyl sulfathiazole have been added to purified diets to study the special toxicities of drugs



^{1.} Simon, M. A.: Pathologic Lesions Following the Administration of Sulfonamide Drugs, Am. J. M. Sc., 205:439-454, 1943.

designed to produce intestinal bacteriostasis.2 It is apparent that sufficient absorption occurs to produce the general toxic reactions to sulfonamides. In addition there is faulty synthesis of essential nutrients as indicated by the observation that folic acid and biotin are necessary for growth in rats fed succinyl sulfathiazole.3 It is not clear whether this inability to synthesize components of the B vitamins is due to bacteriostasis or to interference with essential enzyme processes in the body.

NEW SULFONAMIDE DRUGS

Many experiments now attest the validity of the theory of the mode of action of sulfanilamide as originally proposed by Woods⁴ and Fildes.⁵ Para-aminobenzoic acid is an essential metabolite for the continued growth of many bacterial species. The sulfonamides compete with this metabolite for an enzyme system or systems necessary for bacterial reproduction. Sulfonamide resistance or "fastness" is associated with an inherent or acquired capacity to synthesize para-aminobenzoic acid so that the metabolite is no longer "essential" to the bacterial species.

A number of workers have demonstrated that all sulfonamide compounds effect bacteriostasis in exactly the same way. The greater activity of certain compounds has been correlated with their dissociation constants as acids. Bell and Roblin⁶ demonstrated that antibacterial properties parallel the acid strength of the sulfonyl group of any given sulfonamide. More than one hundred compounds have been studied, and it seems clear that sulfathiazole and sulfadiazine possess a degree of antibacterial power that will not be surpassed by any new sulfonamide.

It is possible, on the other hand, to maintain an optimal ionization of the sulfonyl group and to alter the side chains to produce new sulfonamides with different properties. Such changes will modify the absorption, toxicity, and rate of excretion of the drug. Undoubtedly, new sulfonamide drugs will continue to appear, but they are not likely to be more broadly



^{2.} Daft. F. S., Ashburn, L. L., and Sebrell, W. H.: Biotin Deficiency and Other Changes in Rats Given Sulfanilylguanidine or Succinyl Sulfathiazole in Purified Diets, Science, 96:321-322, 1942.
3. Nielsen, E., and Elvehjem, C. A.: The Growth-Promoting Effect of Folic Acid and Biotin in Rats Fed Succinylsulfathiazole, J. Biol. Chem., 145:713-14,

^{1942.}

^{4.} Woods, D. D.: Relation of p-Aminobenzoic Acid to Mechanism of Action of Sulphanilamide, Brit. J. Exp. Path., 21:74-90, 1940.
5. Fildes, P.: A Rational Approach to Research in Chemotherapy, Lancet. Lond., 1:955-957, 1940.
6. Bell, P. H., and Roblin, R. O., Jr.: Studies in Chemotherapy, VII. A Theory of the Relation of Structure to Activity of Sulfanilamide Type Compounds, J. Am. Chem. Soc., 64:2905-2917, 1942.

effective than presently available drugs. For example, sulfamerazine, or sulfa-monomethyl-diazine, was prepared as a more soluble form of sulfadiazine in the attempt to reduce the incidence of hematuria. It has been found that sulfamerazine is more slowly excreted and more completely absorbed than sulfadiazine, but there is no marked decrease in the incidence of hematuria when comparable blood levels are achieved. The chief advantages of sulfamerazine are that equally effective blood levels can be maintained with a smaller quantity of drug given less frequently. It is to be expected that research will develop a relatively nontoxic drug that will not sensitize the great majority of patients.

LOCAL SULFONAMIDE THERAPY

Sulfanilamide seems to be the most popular agent for local application to wounds because of its greater solubility and lesser tendency to caking. The less soluble sulfonamide compounds have the disadvantage of caking and have been observed to delay wound healing.8 The injection of oily preparations causes an undesirable connective tissue reaction which may outweigh any advantages.9 Intraperitoneally injected compounds are generally reported as more rapidly absorbed than drugs applied to wounds. Sulfadiazine has been recommended for use in the peritoneal cavity, 10 but popular practice avoids the use of the less soluble compounds even in the peritoneal cavity where absorption is more complete.

Search for the sulfonamide antagonist in pus and wound exudates has led to finding that methionine, as well as paraaminobenzoic acid, inhibits the bacteriostatic effect of sulfonamides. 11 12 13 Low concentrations of urea added to inert mixtures of sulfonamides and para-aminobenzoic acid or methionine can restore the bacteriostatic potency of the sulfonamide.13

^{7.} Lyons, C., and Burbank, C.: Local Sulfonamide Therapy. Collective Review, International Abstract of Surgery, 74:571-577, 1942.

8. Hawking, F., and Hunt, A. H.: Sulfonamides Used Locally; Their Absorption from Serous Cavities and Wounds in Man, Brit. M. J., 2:604-606, 1942.

9. Hawking, F.: Histological Reactions to Oils and Sulphonamide Preparations, J. Path. Bact., Lond., 55:41-52, 1943.

10. Ambrose, A. M., Griswold, R. A., and Hamilton, J. E.: Absorption of Sulfadiazine After Oral and Intra-peritoneal Administration in Dogs and After Intra-peritoneal and Local Administration in Man, Am. J. M. Sc., 205: 376-383, 1943.

11. Loomis, T. A., Hubbard, R. S., and Neter, E.: Inhibition of Bactarioscotics.

^{11.} Loomis, T. A., Hubbard, R. S., and Neter, E.: Inhibition of Bacteriostatic Action of Sulfanilamide by Yeast Extracts, Proc. Soc. Exp. Biol., N. Y., 47: 159-163, 1941.

<sup>159-163, 1941.

12.</sup> Harris, J. S., and Kohn, H. I.: On the Mode of Action of the Sulfonamides II. The Specific Antagonism Between Methionine and the Sulfonamides in Escherichia coli, J. Pharm. Exp. Ther., 73:343-361, 1941.

13. Tsuchiya, H. M., Tenenberg, D. J., Strakosch, E. A., and Clark, W. G.: In Vitro Effect of Urea-Sulfathiazole Combination on Sulfathiazole-Resistant Staphylocci, Proc. Soc. Exp. Biol., N. Y., 51:245-247, 1942.

Other in vitro experiments have shown that low concentrations of azochloramid increase the antibacterial effect of sulfonamides for staphylococci and $Esch.\ coli.$ ¹⁴

Mixtures of sulfonamides and these "potentiating" substances have been prepared for local application in clinical tests. Calcium salts have been added as buffering agents to maintain maximal anionic dissociation of the sulfonyl group. Wetting agents, such as sodium tetradecyl sulfate, have been added to insure dispersion and permeation of the final mixture. Brilliant experimental work lies behind such products. It is perhaps too harsh to conclude that such "potentiated" compounds are flat failures, but in fairness it must be said that the test-tube successes have not been duplicated in infected wounds.

New mixtures of sulfonamides for local application are being proposed daily. It seems likely that any compound of value will combine some antibacterial agent in addition to sulfonamide rather than an agent to "potentiate" the sulfonamide.

PROPHYLACTIC SULFONAMIDE THERAPY IN TRAUMATIC WOUNDS

During the last two years, the Committee of Medical Research has sponsored an investigation of the prophylactic value of sulfonamides in traumatic civilian injuries. This program has been prosecuted under the direction of the Subcommittee on Surgical Infections of the National Research Council. A recent report¹⁵ summarizes the statistical analysis of the studies on 1.500 cases. In this entire series there were only four deaths attributed to infection, an incidence of 0.27 percent. This low mortality rate has not been emphasized sufficiently. It is dramatic evidence that sulfonamide therapy prevents systemic invasive infection. The published report presents considerable evidence that sulfonamide has not lessened the incidence of local infection. While this conclusion seems thoroughly dependable, it has vigorous opposition which points out that the factors delaying wound healing and complicating repair are the same factors which prevent effective sulfonamide bacteriostasis. Thus it is argued that the occurrence of infection in spite of sulfonamide prophylaxis is a consequence of improper surgical management of the wound. All

^{14.} Schmelkes. F. C., and Wyss, O.: Inactivation of Sulfonamide Inhibitor by Azochloramid, Proc. Soc. Exp. Biol., N. Y., 49:263-267, 1942.
15. Meleney, Frank L.: The Study of the Prevention of Infection in Contaminated Accidental Wounds, Compound Fractures and Burns, Ann. Surg., 118:171-186, 1943.



those imperfections of technique and errors of judgment cannot possibly be recorded for statistical analysis in relation to the failure of sulfonamides to prevent local infection. It is sufficient to conclude that, at the "applied level" of surgical performance of those participating in the study, the sulfonamides did not prevent local wound infections.

It is unfortunate that the low incidence of wound infection at Pearl Harbor was attributed so largely to sulfonamides. Equally important factors were the short distance for evacuation, prompt surgical attention, and the facilities for continued hospitalization without further transportation. Likewise, it seems unfair to conclude that naval casualties at sea have had little sepsis because of sulfonamides. There has always been a greater incidence of infection as a consequence of injury on land.

Extensive burns are the only traumatic injury in which local sulfanilamide therapy seems definitely contraindicated. The risk of overdosage in consequence of excessive absorption has been repeatedly demonstrated. Clinical trials of less soluble sulfonamide compounds are continuing but it is premature to attempt a final appraisal of such results. It has been shown that an effective blood concentration of sulfonamide can be established by vein or by mouth with safety in severely burned patients and that such therapy will prevent invasive infection.16

Experimental evidence suggests that sulfonamides would be of value in the prophylaxis of gas gangrene due to Cl. welchii or Cl. septicum but not for Cl. oedematiens. The prevalence of Cl. oedematiens in North Africa has made it difficult to assess the value of the drugs in the prophylaxis of gas gangrene on that front. The brilliant report of MacLennan¹⁷ records the occurrence of other types of gas gangrene as well in North Africa, and such facts cast serious doubts as to the potency of a prophylactic scheme based on sulfa compounds. Pulvertaft¹⁸ reports that sulfonamide prophylaxis "has not prevented wound infection" in the Middle East.

To arrive at conclusions regarding the prophylactic value of sulfonamides in the management of Army casualties is dif-

^{17.} MacLennan, J. D.: Anaerobic Infections of War Wounds in the Middle East, Lancet, Lond., 2:63-66, 94-99, 123-126, 1943.

18. Pulvertaft. R. J. V.: Bacteriology of War Wounds, Lancet, Lond., 2:1-2, 1943.



^{16.} Lyons, C.: Problems of Infection and Chemotherapy, Ann. Surg., 117: 894-902, 1943.

ficult. The extensive wounds of the present conflict cannot be subjected to complete wound excision. That procedure would require too much time and inevitably would lead to frequent amputation in extremity injuries. Present practice has been described as "wound trimming"—gross hemorrhage is arrested, the wound is exteriorized by generous incision and packed open. Local sulfanilamide has usually been applied and supplemented with oral therapy. By and large the results are good but bacteria are present in all the wounds. The best results are obtained when the wound is left open, when the pack is not too tight, when skin is not removed, and when the plaster cast is applied over padding and then split to allow for swelling. These rules are not always followed, but, under the best circumstances, it is inevitable that in "wound trimmings" some foreign bodies or devitalized bone fragments will be left behind to serve as foci of infection. These patients present a very real and considerable problem, for the persistent infection is invariably resistant to sulfonamides and many of the patients are sensitive to one or more of the sulfa drugs. The debilitated and anemic state associated with this type of infection does not encourage protracted sulfonamide therapy. In a sense these cases represent failure to achieve a clinical objective, but it would be mischievously opinionative to conclude that such end-results were instances of sulfonamide failure to prevent infection. Many excellent military surgeons still use local sulfonamide therapy and the majority endorse systemic prophylactic treatment.

SUMMARY

The toxic reactions observed from sulfonamides have complicated but have not seriously limited treatment.

It is unlikely that new sulfonamides will be more bacteriostatic than presently available drugs, but less toxic compounds may be anticipated.

Prophylactic therapy has prevented invasive systemic infection and minimized the "spread" of local infections. This success suggests the oral or parenteral route as a method of choice.

Good clinical evidence for or against the continued local use of sulfonamide preparations in wounds is not available. Rapid absorption after intraperitoneal application makes it difficult to evaluate the abdominal cases in terms of local therapy. Considerable doubt prevails about the value of sul-



fonamides in the prophylaxis of gas gangrene. A distinct trend away from local sulfonamide therapy exists, but individual preference and opinion continue to guide such practice.

General hospitals in this country are receiving casualties with chronic infections associated with retained sequestra or foreign bodies. These infections are sulfa-resistant and many of the patients are sulfa-sensitive. The associated debilitated state contraindicates intensive sulfa therapy. Such cases are more often surgical failures than they are sulfonamide failures, but they represent a group of infections requiring some form of antibacterial therapy other than sulfonamides. The need for continued study of surgical infections is evident.

TREATMENT OF TICK FEVER

George E. Baker reports in the Journal-Lancet of July 1943, that a solution of 0.3 gram of neosalvarsan in 10 cc. metaphen 1:1,000 injected slowly intravenously, alternating small amounts with small amounts of withdrawn blood (3-4 injections at three- to four-day intervals), used in about thirty cases of tick fever in the past eight years, has ameliorated clinical manifestations in every instance, and has shortened the duration of the disease and of convalescence. The only contraindication to the use of the two drugs is the presence of renal injury as the result of infection. (Medical Journal Abstracts, E. R. Squibb and Sons, N. Y., Aug. 1943)

MALARIA VECTORS OF THE NORTH ITALIAN PLAIN

Anopheles maculipennis atroparvus occurs near the delta of the Po, around Ferrara, and southward as far as Tuscany. A. maculipennis elutus (sacharovi) is important in the Po delta, where it overlaps atroparvus, and extends along the northern Adriatic coast and into Friuli. A. maculipennis messeae has been reported at Mantua and Ravenna and is considered responsible for malaria in these places. A. maculipennis melanoon occurs in rice-growing regions of northern Italy and has been found at Mantua. A. maculipennis typicus has been found at Mantua. A. maculipennis labranchiae occurs along the western Italian littoral. No record has been found of this species occurring in the Po valley.



Study of Prevention of Infection in Wounds, Fractures, and Burns

Two years ago, at a meeting of the American Surgical Association, a paper was read by title which outlined a plan for the study of war wounds. The plan called for ten units in as many different cities, each unit to be fully equipped with clinical and laboratory facilities to care for and study cases of civilian accidental wounds, compound fractures, and burns which would simulate war casualties. All of the wounds were to be treated basically by as complete a surgical débridement as possible. The débrided tissue was to be sent to the laboratory for a complete analysis of the bacterial flora. A limited number of different kinds of local and general treatment, with a proper series of controls, were to be employed to appraise, if possible, the newer chemotherapeutic agents in the prophylaxis and in the treatment of wound infection. Careful observations and records were to be made of the course of wound healing and particularly of any evidence of infection. If infection developed, its nature and etiology were to be determined by further laboratory studies and the cause of the failure of the preventive measures was to be analyzed. A carefully prepared summary sheet was planned to contain all of the available data from the record of the case which might indicate what factors favor or minimize the development of infection. These data could then be transferred to punch cards for statistical analvsis.

Six months later the plan was finally approved by the Committee on Medical Research of the Office of Scientific Research and Development, but it was limited to eight of the original ten units. Before the personnel could be mobilized and equipment purchased, Pearl Harbor was bombed and we were at war. The question of the best way to use the new chemotherapeutic agents in war wounds still remained unan-



Condensation of an article in Annals of Surgery, August 1943, by Frank L. Meleney, M.D., who represented the Subcommittee on Surgical Infections of the National Research Council, and the responsible investigators of the Contaminated Wound and Burn Project under the Committee on Medical Research of the Office of Scientific Research and Development: Doctors Guy Caldwell, Warfield Firor, Charles Johnston, Sumner Koch, John Lockwood, Perrin Long, Champ Lyons, Roy McClure, Alton Ochsner, Mont Reid, and Frank Meleney, Chairman.

swered because it had been impossible to evaluate the drugs in England. The rapid evacuation of patients from hospital to hospital in a centrifugal manner had made it difficult to follow cases from the beginning to the end of the treatment.

On 1 February 1942 the eight units began to function. The original plan was altered to a considerable extent by the reports which came back from Pearl Harbor. Observers who saw the casualties there were profoundly impressed by the low incidence of wound infection, which they believed to be due to the copious application of sulfanilamide to the wounds. Our original plan called for observation on control cases without drugs and other controls receiving treatment with local bacteriostatic agents other than the sulfonamides. But, said the Pearl Harbor observers: "You cannot withhold from these patients the benefit of the sulfonamide drugs."

Instead of twelve different categories to cover the whole field as we originally planned, we reduced the range of our investigation to one principal method of treatment, with one optional control. In so doing, it was recognized that we might have all of our eggs in one basket and find, after a period of time, that the basket would fall and the eggs be broken.

During the period of our delay, sulfadiazine had come into use. It was found to be less toxic than sulfanilamide, less nauseating than sulfapyridine, and less likely to block the kidneys than sulfathiazole. Its range of antibacterial activity was thought to be as wide as any of the other drugs and it was, therefore, decided upon as the drug of choice for systemic administration. For local application it was decided to use equal parts of sulfanilamide and sulfadiazine powder on the theory that the sulfanilamide in a concentration of 1,000 mg. percent would be active for several days before it was absorbed. The more slowly absorbable sulfadiazine would then continue to act over a long period of time, possibly as long as ten or fourteen days.

Seven of the eight units undertook to study all three of the major categories of injuries, namely, soft-part injuries, compound fractures, and burns, while the eighth concentrated on burns.

With regard to burns there were strong advocates for three different methods of treatment. These were (1) the tannic acid method; (2) the vaseline compression dressing method; and (3) the sulfadiazine in triethanolamine spray. A fourth experimental method was permitted each of the units.



No attempt was made to dictate procedures. The surgeons were directed to perform as complete a débridement of the wounds as possible, but beyond that they were given full liberty to decide other details of the treatment. In those units in which nondrug-treated controls were used, every care was taken that there should be no selection of control or treated cases but that they should alternate regularly.

Great care was taken to make accurate observations and careful records so that we should know just how the cases were handled. It was decided that all those having the care of the patient should determine, as a group, whether or not infection had developed and whether it was trivial or serious. The criteria of infection included not only the bacteriologic findings but the clinical evidence of inflammation, namely, redness, swelling, pain, fever, undue exudate, necrosis of tissue, or delay of wound healing. There may have been differences of opinion on individual cases but we believe that, on the whole, the personal equations have been pretty well neutralized. As the responsible investigators of the different units have gathered in Washington to talk over their experiences, it has been obvious that all of the units have had similar experiences and remarkably similar results.

As the records came in, the data were transferred to punch cards and were then analyzed according to common factors. For the most part, it was possible to divide the cases into two or three groups within each category; for example, they were separated into those having maximum and those having minimum gross contamination and similarly maximum and minimum tissue damage. Those operated upon within three hours were compared with those operated upon after three hours. With regard to wound closure, three groups were compared. namely, wounds left open, wounds partially closed, and wounds completely closed; and so with all of the factors which we thought might play a role in favoring or minimizing the incidence of infection. In each of these groups the number and percentage of trivial and serious infections have been determined. As the summary sheets steadily accumulated in the central office, the number of cases in each group steadily mounted and it became necessary to apply the statistical formula which biostatisticians use to determine whether percentage differences are statistically significant or may be due merely to chance.



The records from the first 1,500 cases have been summarized in the present report. These include 682 wounds of the soft parts, 471 compound fractures, and 347 burns. Each group has been dealt with separately, although they have much in common when it comes to a consideration of those factors which tend to favor or minimize the incidence of infection. These factors inherent in wounds and burns have been well known to surgeons for a long time, and they have known many ways of aiding nature to ward off infection. A study of this kind would not be warranted at this time if some new method of combating infections had not come to light which must be thoroughly evaluated with respect to war wounds and burns.

With the advent of the newer chemotherapeutic agents, the surgeon now has the opportunity of applying to the wound surfaces or administering internally a bacteriostatic agent. However, these may not be used without some risk of toxicity to the blood-forming organs, liver, and kidneys. Furthermore, it is known that certain conditions may be present in wounds and burns which may inhibit the bacteriostatic action of these drugs.

SOFT-PART WOUNDS

This group reported an incidence of 16.5 percent of infection in soft-part wounds as a whole, with twice as many trivial infections as serious infections, although there is, they say, no clear-cut division between these two groups, for one shades off into the other. Operation after three hours, incomplete débridement, and prolonged washing are associated with a high incidence of infection. The figures for prolonged washing are surprising and may indicate that the washing of a dirty wound before débridement may disseminate the organisms throughout the wound and that irrigation all during the operation may wash organisms in from the surrounding skin and further damage the tissue. Wounds which are partly closed showed a higher figure than those left open or those completely closed. which may mean that partial closure frequently had sutures under tension or the surgeon had grave doubts that the wound should be closed. Closure under tension, when that was noted, frequently seemed to play a major role in the occurrence of infection. By every method of grouping these cases from the point of view of chemotherapy, no evidence could be found in this study that either sulfanilamide or equal parts of sulfanilamide and sulfadiazine locally or sulfadiazine generally



with or without the local use of drugs cut down the incidence of local infection. However, it was true that the incidence of septicemia or of death was extremely low in this series and it may be fairly stated that the spread of infection from the local site has been minimized, for cases which have become infected either during the administration of drugs or without preliminary drug treatment have all been given systemic sulfonamide treatment if and when they could tolerate it. There were only two deaths from infection, or 0.3 percent.

The bacteriology was interesting and important. Certain organisms stand out: the hemolytic streptococci, coagulase-positive staphylococci, the pathogenic gram-negative bacilli, the welchii bacillus, and the anaerobic cocci. These were found in the débrided tissues in many cases, but in the great majority they did not persist; however, in many instances these same groups appeared in later cultures in cases in which they were not originally found. The chances are, the author says, that they often represented secondary contamination occurring during the course of treatment, particularly in compound fractures and burns. The sulfonamides did not eliminate the organisms found in the débrided tissues and did not prevent secondary contamination and infection.

COMPOUND FRACTURES

In this series, early operation, complete wound débridement, and long wound washing did not appear to play as important roles as with soft-part wounds. The incidence of infections when the wounds are closed completely is less than when the wounds are left open or are partially closed. This was a consistent finding throughout the studies, and seems to be reasonably explained when it is considered that wounds left open, with fractured bone exposed, are subject to secondary contamination over a fairly long period of time before the bone has had a chance to grow a protective covering of granulation tissue. In this group of cases, the combined local and general or the general use of sulfonamides alone has not lowered the incidence of local infection. Only two cases in this group died as a result of infection, and both of these had local as well as general prophylactic sulfonamide therapy.

There was a higher proportion of these cases yielding hemolytic streptococci, coagulase-positive *Staphylococcus aureus* and *Cl. welchii* in the soft-part wounds, and, furthermore, they more often persisted and more often appeared as new cultures. The



pathogenic gram-negative aerobes did not appear as often initially, but appeared anew in a much higher percentage in compound fractures than in soft-part wounds. The sulfonamides did not particularly favor their elimination or prevent their secondary development.

BURNS

As with the other groups of cases, the extent of the involved area, depth of the injury, the intensity of gross contamination, and tissue damage ran parallel with the percentage of infections. The infection rate in burns was, the author says, very disturbing, particularly in deep second- and third-degree burns. Methods of treatment vary. The compression dressing method stood out as representing the greatest proportion of right principles and the lowest incidence of infection. The initial dressing containing a bacteriostatic agent had a slight, not clear-cut, superiority over the simple nonadherent ointments. Only two burn deaths occurred in which infection played an important role, and they were so extensive that they might have died without infection; both of them had local and general sulfonamide treatment.

The bacteriologic studies in this group reveal that many of the hemolytic streptococci persisted in the burned area or came in as new contaminants in the face of local as well as general sulfonamide therapy. The staphylococci were the most numerous of the pathogens in the persistent and new cultures, but the gram-negative aerobic bacilli, particularly *E. coli*, *B. pyocyaneus*, and *B. proteus* groups, run the staphylococci a close race. If the problem of infection of burns is to be solved, it must be concerned, the author says, with all of these groups of organisms.

CONCLUSIONS

These investigators found that the sulfonamides minimized the spread of general infections and cut down the incidence of septicemia and death. They have no evidence, however, that the sulfonamides lessen the incidence of local infection when used as these units employed them. Some other forms of the sulfonamides or some other bacteriostatic agents must be found which will be effective against the contaminating organisms in the presence of damaged tissue, it is said, if we are going to lessen the incidence of local infection in war wounds and burns.



Bacteriology of War Wounds

The want of a standard technique of wound culture has been responsible for wide variations in individual findings. Pulvertaft, using a standardized technique, has reported the results of examining 192 war wounds contracted during the campaign of El Alamein. Most of the cases were examined by sending to the laboratory a "dip swab" specimen taken by the surgeon. When these were cultured directly onto media, an entirely different result was obtained from that found when the swab was soaked for five minutes in broth and then cultured. It was observed that when cultures were taken, at the bedside by a bacteriologist, with a platinum loop onto a medium, hemolytic streptococci were nearly always found, whereas with the "swab" cultures, the average incidence was Furthermore, pus on a dressing showed only 30 percent. vastly more organisms than pus in a wound. While the author emphasizes that this investigation was not a complete one, he believes that the results may be taken as representative.

The cases were all battle casualties. It was the practice in the Middle East forces to give sulfonamide prophylactically in all such cases. The advice of the neurosurgical specialists was to give 25 gm. of sulfanilamide orally in the first forty-eight hours and the powdered drug locally. Other surgeons advised, the author says, about half this dosage, and in nearly all cases, as far as can be determined, the drug was administered both locally and orally. In 57 cases repeated examinations of the same cases were made. Multiple infection was found to be common. On re-examination, old organisms disappeared and new organisms appeared, caused, in part at least, by the fact that a strictly standardized technique is rarely if ever followed and that organisms seem to be latent in a wound, to appear when a change in treatment is made.

Although wound sepsis was common, it caused an "insignificant" death rate outside brain, spine, chest, and abdomen. Pulvertaft compared the figures for the first world war with those of the present series, and found, in the official history, that wound infection was rife in 1918; in fact, it was stated that all wounds might be considered infected, just as they may

^{1.} Pulvertaft, R. J. V.: Bacteriology of War Wounds; Lancet, London, 2: 1-2, 1943.



be considered today, and yet the mortality rate in the last war among 10,000 British cases was 0.5 percent from all causes; as some of this was due to gas gangrene, which had a fatality rate of 25 percent, there was not much left over for wound sepsis. At the end of the first world war, without sulfonamides and without closed plaster, the septic wound was not a danger to life.

The impression appears to be fairly general at present that closed plaster, sulfonamides, and the emergence of orthopedic surgery have revolutionized infection in wounds. The fact is that sepsis is all but universal, and few die of it now; the condition was comparatively identical in 1918. There seems to be no evidence, Pulvertaft says, that oral sulfonamides will control sepsis in established suppurations.

Local wound therapy is variously attempted; certain orthopedic and neural surgeons prosecute it vigorously, while other individuals consider it useless. It is fair to say that it is usually not possible, because of the closed-plaster technique, and the bogy of "hospital infection" tends to discourage it.

To make false inferences from Pulvertaft's figures, he admits, would be easy. The important fact is not what organisms are in a wound, but how the wound behaves and what the result is to the patient. From the information given, no direct comparison of that kind can be drawn. Pulvertaft arrives at the following conclusions:

- 1. A standard technique for the bacteriologic examination of war wounds is desirable.
- 2. As in the last war, all war wounds must be considered to be contaminated or infected.
- 3. The commonest infections are staphylococcal. Streptococcal infection is widespread. Clostridia are often present, but clinical gas gangrene is rare. Gram-negative organisms are common, particularly in old wounds. Clinical tetanus is not found; the bacillus is often present.
- 4. Sulfonamide prophylaxis, local and general, is widely used but has not prevented wound infection.
- 5. Infection of wounds is still the gravest problem in treatment. It is a prime cause of death in wounds of head, spine, thorax, and abdomen.
- 6. Wounds in other parts of the body, though infected, do not often cause death from infection. Since this was also the case in 1918, there is no evidence that the position has im-



proved. There is a general impression that sepsis is less severe and of shorter duration. But many cases, in a degree and in numbers directly proportional to the degree of tissue damage, suppurate profusely and for long periods with grave effects on the patient.

7. There seem, therefore, to be strong reasons for the employment in selected cases of more vigorous methods of wound treatment than those usually pursued in the *laissez-faire* atmosphere of closed-plaster technique.

MILK CONSUMPTION

In many localities milk shortages have made it exceedingly difficult to procure sufficient fresh milk to meet military and civilian requirements. To alleviate the situation in shortage areas the War Department has approved a tentative specification covering pasteurized reconstituted milk, pasteurized blended milk, and pasteurized milk standardized with reconstituted skim milk. Milk is to be purchased under these specifications only under specific authorization by the Office of The Quartermaster General.

Prior to the present emergency, the common method of preparing reconstituted milk was through the use of skim milk powder and high grade fresh cream or sweet butter or from good quality whole milk powder. Since the beginning of the war and the development of milk shortages in various areas, there has been a tendency to advocate on a larger scale than heretofore the preparation of reconstituted milk from bulk condensed milk which has not been rendered sterile. While it is possible to prepare a satisfactory reconstituted milk from such bulk condensed product, the procedure admits of more opportunities for contamination and deterioration than is the case with reconstituted milk prepared from high grade milk powder and fresh cream or butter. Bulk condensed milk is as subject to contamination as fresh milk. On the other hand, as the lactic acid organisms are destroyed during processing, the condensed milk does not readily sour, thus eliminating a common and well-recognized indicator of the age and quality of the milk. It is, therefore, important that close sanitary supervision be exercised and adequate bacteriologic examinations be made during the processing and handling of this type of milk.

Veterinary meat and dairy hygiene reports indicate that, of troops in the United States, the average daily consumption of fresh milk is a little over a half-pint per man.



Original Articles

Sulfaguanidine in the Treatment of Bacillary Dysentery

A Study of 520 Cases

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Many writers have called attention to the fact that sulfaguanidine is efficacious in the treatment of bacillary dysentery¹ and to the use of this drug in the treatment of bacillary dysentery carriers.⁸ ¹² During the five-week period, ending 28 June 1943, 520 cases of acute bacillary dysentery were treated with sulfaguanidine at the 151st Station Hospital in Northwest Africa.

All of the cases presented typical symptoms of an acute dysentery, with the passage of from five to fifty daily stools containing blood, pus, and mucus, and exhibited extreme prostration, chills, fever, nausea, vomiting, weakness, tenesmus, anorexia, and dehydration.

Ninety percent of the patients were febrile on admission. Admission temperatures ranging as high as 105.4°, and as low as 97.0°, were seen. The mean temperature was 102.4°.

Generalized abdominal pain recurring at intervals in the form of cramps was noted in 85 percent of the cases, while tenesmus was complained of by 42 percent of the cases.

Forty-eight percent of the patients experienced one or more true shaking chills prior to admission to the hospital. This high instance of true shaking chill presented many diagnostic problems as, not infrequently, cases of *Plasmodium falciparum* malaria present themselves with chills and fever, accompanied by bloody diarrhea. Nausea and vomiting were present in 45 percent of the cases.

Blood in the stools was noted by 33 percent of the patients. This figure probably should have been higher as many patients were unable to state whether their stool contained blood, pus.



This paper has been abbreviated by the omission of certain tables showing the sulfaguanidine content of urinary samples in 10 cases, and charts I and II, showing respectively the temperature and pulse curves of 6 representative cases, and of 2 cases of drug fever following the use of sulfaguanidine.

or mucus, because of the fact that the majority of the patients were using field latrines where observation of the character of the stools was impossible. The frequency of bowel movements during the twenty-four hour period preceding hospitalization ran from five to fifty. The average frequency per patient was eight stools for that period of time.

Among the various other symptoms that made themselves known were: anorexia, 25 percent; headache, 12 percent; general aches and pains, 10 percent; and dizziness and weakness, 10 percent.

CLINICAL COURSE

The 520 cases of acute bacillary dysentery were among young adults, whose average age was 27 years. Practically all of the patients had been ill a matter of a few hours, while a very few had had symptoms for as long as twenty-four to forty-eight hours prior to admission. The patients were extremely prostrated, toxic, dehydrated, and several were admitted with a history of sudden and complete collapse while on duty. One man was found lying in the road, conscious but too weak to get up. Many of the patients were so seriously ill as to dispel any preconceived notions of the invariable mildness of bacillary dysentery caused by the Flexner group of organisms.

The response to therapy was rapid. The majority of the cases had normal temperatures by the third or the fourth day. The second day the stools became semisoft and showed less blood, pus, and mucus. By the third or the fourth day the stools were becoming formed, and the blood, pus, and mucus had disappeared. By that time bowel movements averaged but one or two a day.

Sigmoidoscopic examinations were performed on patients failing to improve after a ten-day course of therapy.

ETIOLOGY

Inasmuch as there had been a number of hospital admissions a few weeks previously due to atabrine sensitivity, with symptoms closely resembling those of dysentery in that they too had loose stools, vomiting, cramps, and tenesmus, it was thought of interest to determine what proportion of the patients with dysentery had noted previous sensitivity to atabrine. Only 19 percent stated that they had had previous intestinal upset upon taking atabrine.



Many of the Army encampments were in proximity to unsanitary native dwellings. There was a distinct possibility that the outbreak of the dysentery was caused by the ingestion of food or drink from native establishments in these unsanitary surroundings. Extensive investigation of food and water in the Army messes failed to reveal them as possible sources of the outbreak. Only 24 percent of the patients admitted having ingested food from other than the usual Army sources. The large increase in the number of flies was noted coincident with the outbreak of the disease. Many colonies of Shigella paradysenteriae were grown from the footprints of flies caught in Army messes, living quarters, and latrines.

It is well known that a large percentage of the native population are chronic carriers of bacillary dysentery. In doing routine stool cultures on 54 civilians employed in this hospital, it was noted that 8 percent of these civilians had Shigella paradysenteriae in their stools, even though they were asymptomatic at the time the culture was made.

Manson-Bahr¹² calls attention to the fact that outbreaks of dysentery are frequently seen in recent arrivals in Africa. British medical officers have frequently called attention to the fact that soon after their troops disembark in this theater, epidemics of diarrhea break out. The name given to these outbreaks was "Gyppy tummy" (Egyptian stomach). Fifty percent of the patients in this series had been in Africa less than four weeks.

TREATMENT

All patients, on admission, were placed at strict bed rest in special isolated wards where enteric precautions were followed.

Diet. Liquids consisted of bouillon, soups with added salt, tea, fruit juices, chocolate milk, as well as liquid gruel and gelatins. Within the first twenty-four to forty-eight hours, the patients were usually able to retain a soft diet. When the patients' temperatures reached normal, a regular diet was given.

Drugs. A routine ten-day course of sulfaguanidine was started immediately after the initial admission stool was obtained for culture. We found it impracticable to weigh our patients, and therefore did not follow the recommended dosage based on body weight, but gave all patients a standard dosage as follows: an initial dose of 7 grams was followed



by $3\frac{1}{2}$ grams every four hours, for the first forty-eight hours. After that, $3\frac{1}{2}$ grams were given every eight hours, to complete a ten-day course averaging a total dosage of 130 grams.

Bismuth, 1 gram, and paregoric, 4 cc., were given every eight hours as necessary, for the relief of severe abdominal griping and tenesmus.

Fourteen patients failing to respond to the initial ten-day course of sulfaguanidine, as evidenced by persistent positive stool cultures or continued frequent loose stools, were given a five-day course of sulfadiazine as follows: 2 grams at once, and then one gram every four hours, day and night, for two days; and then one gram every eight hours for the remaining three days, making a total dosage of 23 grams for the five-day period.

Intravenous infusions and fluid intake. The fluid intake is regarded as having great importance. Patients were given a total of 3,000 to 3,500 cc. per day, including all forms of liquids. Markedly dehydrated patients, and those who could not retain fluids by mouth, were given 1,000 cc. of glucose in normal saline, every eight hours. No plasma or whole blood transfusions were given.

LABORATORY DATA

All patients had stool culture on admission. If the initial stool culture was negative, the patient was released from the hospital at the end of his ten-day course of sulfaguanidine. If the patient's admission stool culture was positive, three consecutive negative stool cultures were required before he was released from the hospital. Five days were allowed to elapse after the completion of the sulfaguanidine therapy before beginning to collect the three stool specimens on successive mornings.

A red blood cell count, a white blood cell count, a differential white blood cell count, and a urinalysis were done on each patient upon admission. Average values are shown as follows:

1. Average red blood cell count	4,500,000
2. Average white blood cell count	7,100
3. Highest white blood cell count	15,450
4. Lowest white blood cell count	2,500
5. Average differential count: Polys	64 %
Lymphs	36 %



TABLE I

Total number of cases520	
Total number of cases with positive culture208 a. Positive for Shigella paradysenteriae 190 (91.4%) b. Positive for Shigella sonnei 18 (8.6%)	(40%)
Number of cases with a single negative admission stool	(37.7%)
Number of cases positive after initial course of therapy	(2.7%)
Number of cases with positive stools after second course of therapy	

BACTERIOLOGY

Because of the limited supplies available and the field conditions under which this work was done, bacteriologic procedures were necessarily simplified. All the stools were emulsified with equal parts of physiologic saline and streaked out on a selected medium of desoxycholate citrate agar, or S.S. agar. Clear colorless colonies were fished to Russell's double sugar, or Kliegel's iron slants. Those that showed typical reactions were studied morphologically and biochemically with sugars, and agglutinated against known antisera. At the present time the nomenclature of the dysentery group may be slightly confusing. The organisms that were formerly known as Strong variety, Hiss-Y, or Russell variety, are now included in the Flexner group. In fact, at present, thirteen, possibly fifteen, different types of Flexner bacilli can be recognized.

There were 208 patients with positive stool cultures. Table I shows the results of these stool cultures. There were one hundred and ninety positive cultures for Shigella paradysenteriae, and eighteen for Shigella sonnei. Only 2.8 percent of this series (14 cases) required a second course of sulfonamide (sulfadiazine was used) in order to render their stools negative. These 14 cases were all due to Shigella paradysenteriae.

Unfortunately, the cases in this series could not be observed for any length of time but were discharged within a few days after the course of sulfaguanidine was completed and negative stools were noted. Patients with an initial negative stool were only observed during their ten-day course of therapy, while the other patients with positive stools were followed for a period of approximately twenty days.



TABLE II Stool cultures of control group

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It is felt, that while there were only 208 positive cases of bacillary dysentery as proved by the stool cultures, it is highly probable that a good many more of the cases had true bacillary dysentery. The reasons for this assumption are twofold:

- 1. In many cases the initial single admission negative stool culture represented the only culture taken of that particular patient. Reference to table II reveals numerous instances in which positive cultures were obtained after a negative report had been received on the previous stool culture. (See cases 5, 11-15, 17, and 21.) Had a series of six to twelve stool cultures been possible on each patient, the incidence of positive stool cultures would probably have been higher than the 40 percent of positive cases noted.
- 2. Although still debatable, it is possible that the percentage of positive cultures would have been higher if nicotinamide or nicotinic acid had been used in the culture media as suggested by Koser. 16 The observations of Koser and his associates are very interesting. They found that many Flexner and Sonne bacilli either failed to grow, or grew only poorly, in a basic medium consisting of fifteen amino acids, glucose, and inorganic salts. Addition of nicotinamide or nicotinic acid exerted a marked growth-promoting effect. These substances may therefore be considered essential growth factors for these strains.

CONTROL CASES

For the purposes of closer clinical and laboratory study, 21 cases were set aside and treated as follows: all of the patients had temperatures recorded three times daily, the number of stools recorded daily, a daily stool culture, and agglutination titers versus *Shigella paradysenteriae* on the seventh and fourteenth day after the onset of the disease.

The group of 21 patients was divided into two subgroups of 10 and 11 patients. The subgroup of 10 patients received sulfaguanidine, while the second subgroup of 11 patients did not receive the drug. Both groups received bismuth, paregoric, and tincture of belladonna, as necessary. In addition to the above orders, the following special studies were made:

Patients receiving sulfaguanidine: (1) Complete blood count and urinalysis every two days while receiving the drug. (2) Blood sulfaguanidine levels on the third, sixth, ninth, and twelfth days, after the drug had been started. (3) Total sulfa-



guanidine urinary excretions in the daily twenty-four hour urine output.

Patients not receiving sulfaguanidine: Complete blood count and urinalysis on admission and on the tenth hospital day.

Points on which it was hoped that this control group would throw light, included the following: (1) The efficiency of sulfaguanidine in ridding the gastro-intestinal tract of the dysentery bacillus. (2) The efficiency of sulfaguanidine in controlling the symptoms of diarrhea, vomiting, fever, chills, etc. (3) Any toxic effects of sulfaguanidine on the blood, the kidneys, the neurological system, etc. (4) Whether positive stool cultures, when dealing with Flexner bacillus, are constant or equivocal, as pointed out by Rantz and Kirby⁸ and Opper and Hale. (5) Blood sulfaguanidine levels from large doses such as were used in these cases. (6) Total excretions of sulfaguanidine in the twenty-four hour urine samples.

In the treated control group it would have been of interest if these patients could have been followed for a period of from one to three months, obtaining daily stool cultures to determine if, or when, any cases might become positive following the course of sulfaguanidine. However, Opper and Hale, 10 in a small series of 33 cases, found that 29 remained negative for the dysentery bacillus over an average period of one hundred five days, followed by a seven-day treatment of 28 grams of sulfaguanidine. The four cases that subsequently became positive after the original course were rendered negative by a second course of 28 grams. In the Opper and Hale series this represents an incidence of 12 percent requiring a second course of sulfaguanidine. Anderson and Cruikshank,4 in using 62 grams of the drug, felt that even larger doses might be used with good effect. The low percentage of cases (2.8 percent) requiring a second course of therapy in our series of 520 cases would certainly speak in favor of larger doses (130 grams).

CONTROL OF SYMPTOMS

There was a very rapid response to therapy. The majority of the cases had normal temperatures and pulse rates by the third or the fourth day. On the second day the stools became semisoft and the diminution of blood, pus, and mucus was very marked. Third or fourth day stools were usually well formed and the blood, pus, and mucus had disappeared.



TOXIC EFFECTS OF SULFAGUANIDINE

Three patients developed drug fever which subsided as soon as the drug was withdrawn. To prove the etiology of this fever, the drug was again given and hyperpyrexia developed. There were no anemias, leukopenias, or other toxic effects in the blood. Anderson and Cruikshank reported no toxic effects in their series of 41 adult Flexner bacillary cases treated with sulfaguanidine. In spite of the finding of sulfaguanidine crystals, sometimes in very large amounts, in the urine of all patients receiving sulfaguanidine, there were no renal complications in this series. Examinations of hundreds of urine specimens failed to reveal any evidence of renal irritation as evidenced by albuminuria or hematuria. Barnes¹⁷ calls attention to the fact that alkalinity and temperature increased the solubility of sulfadiazine and sulfathiazole in the urine, and has conclusively proved that the urine should be rendered alkaline in all patients receiving sulfadiazine and sulfathiazole. DeCandole's¹¹ is the only paper that this author has seen that refers to the use of sodium bicarbonate with each dose of sulfaguanidine. No attempt was made in these cases to alkalize the urine, and no complications were seen. No skin rashes or neurological effects were noted.

STOOL CULTURE

Rantz and Kirby⁸ and Opper and Hale¹⁰ emphasize that the presence of Shigella paradysenteriae in carriers has a tendency to be intermittent, the organisms being excreted for one or two days and then not again for weeks or more. The usual criteria of a few successive negative stools following the termination of the acute illness cannot be accepted as a guarantee against the reappearance of the organism. In the Opper and Hale series, 4 out of the 33 patients taking the drug underwent a recrudescence of their infectivity, indicating that caution must be exercised in deciding when the carrier state is definitely In both sulfaguanidine treated and non-sulfaguanidine treated cases, positive and negative stools may be found in the same patient at different times. The urgency of the situation which required that these patients rejoin their units at the earliest possible moment so that many of them might take their responsible positions among the key units engaged in the invasion of Sicily prevented observation over a long period of time to ascertain if any of these cases would subsequently become carriers. There is no doubt in our mind but that three



TABLE III

Blood Sulfaguanidine Levels
(Mg. per 100 cc. of blood)

								P. F.			;					İ				-	
Days	-	83	3	4	2	9	7	∞	6	10		12	13	14	15	16	17	18	19	02	21
Case 1															3.0			3.0	 		3.0
Case 2											1.1			2.0			1.8				
Case 3													.709			.932			1.6		
Case 4										1.2			1.5			1.3					
Case 5	•												.10			1.5			1.5		
Case 6								·					1.9			1.5			1.6		
. į asu.)												5.0			2.1			2.0			
Case 8						2.9			1.7			.922								\	
Case 9			2.5			2.3			2.6												
Case 10									2.3			1.5			2.3						
Case 11			3.2			4.8		 -	3.5												

negative stool cultures required for discharge from the hospital are too few. Just how many would be considered the proper number is still questionable. It is probable that troop movements in an active theater of war would prevent observations as long as the period of a hundred five days as in the Opper and Hale series, but certainly a happy medium of about fifteen consecutive stools might be aimed at, rather than the three which are at present the requirement for discharge from the hospital.

BLOOD SULFAGUANIDINE LEVELS

Smyth¹⁹ reported blood concentrations as high as 16.0 mg. percent in his series of aged patients, while Lucchesi and Gildersleeve²⁰ found blood levels in children as high as 9.5 mg. percent. Table III shows that the highest blood concentration level reached in this series in young adults was 4.8 mg. percent. In the excretion of sulfaguanidine in the twenty-four hour urinary samples, the highest value reached in this series was 2.5 grams.

DISCUSSION

In any large group of sulfonamide treated cases complications of one sort or another are common. This varies with several factors, among them being the sulfonamide used, dosage, blood level, amount excreted by way of the urinary tract, reaction of the urine, individual sensitivity, and the length of time that the sulfonamide is administered. The very low instance of complications seen in this series of 520 cases would seem to indicate that sulfaguanidine should be the choice in bacillary dysentery, as sulfathiazole and sulfadiazine are definitely more toxic. In the 14 previously mentioned cases which did not respond to the original course of sulfaguanidine, a course of sulfadiazine was used with good results. We feel that by using sulfaguanidine in place of a second course of sulfadiazine equally good results could have been obtained. Opper and Hale, 10 as well as Cornell and his associates, 21 found that a second course of sulfaguanidine was effective in the few cases in which the first course failed.

Dowling and Lepper¹⁸ found the incidence of toxic reactions with sulfapyridine, sulfathiazole, and sulfadiazine to be 29.4 percent, 11.8 percent, and 7.7 percent, respectively, while Long²² found the toxic reactions to the above-named drugs to be 15.9 percent, 18.6 percent, and 6.5 percent respectively.



The fact that toxic reactions (drug fever) occurred in only 0.6 percent (3 cases) would indicate that sulfaguanidine is the drug of choice in the treatment of bacillary dysentery caused by Shigella paradysenteriae and Shigella sonnei. It is possible that the low toxicity in this series is due to low blood levels (the highest was 4.8 mg. percent), as Dowling and Lepper found the incidence of renal calculi was nil at blood levels of 1.0 - 4.0 mg. percent, but rose to 3.4 percent when blood levels reached 10.0 mg. percent, using sulfapyridine, sulfathiazole, and sulfadiazine.

The three cases of drug fever caused by sulfaguanidine in this series were the first that the author has seen. As far as is known, there is no reference in the literature to date on this complication.

CONCLUSIONS

- 1. Five hundred twenty cases of acute bacillary dysentery were treated with sulfaguanidine during a five-week period ending 28 June 1943 in Northwest Africa.
- 2. There were no deaths or serious complications. Three cases of drug fever responded to withdrawal of the drug. No urinary complications were seen, although numerous sulfaguanidine crystals were observed in urine specimens of all of the patients taking the drug. Close observation of the blood revealed no anemias or leukopenias. More than 91 percent (190 cases) of the positive cases were Shigella paradysenteriae, while not quite 8 percent (18 cases) of the positive cases were Shigella sonnei.
- 3. Sulfaguanidine blood levels as high as 4.8 mg. percent were observed.
- 4 Sulfaguanidine urinary excretions in twenty-four specimens reached as high as 2.5 grams.
- 5. Of the cases remaining positive after the first course of sulfaguanidine therapy, 2.9 percent (14 cases) were rendered negative by a five-day course of sulfadiazine.
- 6. Shigella paradysenteriae appears intermittently in the stools of both the treated and the untreated patients.
- 7. Three negative stool cultures were inadequate as proof of the noninfectivity of the patient.



REFERENCES

- 1. Marshall, E. K., Jr., Bratton, A. C., Edwards, Lydia B., and Walker, Ethel: Sulfanilylguanidine in Treatment of Acute Bacillary Dysentery in Children, Bull. Johns Hopkins Hosp., 68:94, Jan. 1941.
- 2. Marshall, E. K., Jr., Bratton, A. C., White, H. J., and Litchfield, J. T., Jr.: Sulfanilylguanidine: A Chemotherapeutic Agent for Intestinal Infections, Bull. Johns Hopkins Hosp., 67:163, Sept. 1940.
- 3. Bulmer, Ernest, and Priest, W. M.: Sulfaguanidine in the Treatment of Bacillary Dysentery, J. R. Army M. Corps, No. 6, Dec. 1942.
- 4. Anderson, David, and Cruikshank, Robert: Treatment of Bacillary (Flexner) Dysentery with Sulfaguanidine, British M. J., 2:497-501, 11 Oct. 1941.
- 5. Lyon, G. M.: Treatment of Acute Bacillary Dysentery, U. S. Nav. M. Bull., 39:278, Apr. 1941.
- 6. Keiter, W. E.: Treatment of Bacillary Dysentery in Infants, Virginia M. Month., 67:161, March 1940.
- 7. Brewer, A. E.: Sulfaguanidine in Bacillary Dysentery, British M. J., 231:260.
- 8. Rantz, L. A., and Kirby, W. M. M.: The Use of Sulfaguanidine in the Treatment of Dysentery Carriers, J. Am. M. Ass., 118:1268, 11 Apr. 1942.
- 9. Firor, W. M., and Poth, E. J.: Intestinal Antisepsis, with Special Reference to Sulfanilylguanidine, Ann. Surgery, 114:663, Oct. 1941.
- 10. Opper, Lincoln, and Hale, Virginia: Sulfaguanidine in Treatment of Dysentery (Bacterium Flexneri) Carriers, J. Am. M. Ass., 119:1489, 29 Aug. 1942.
- 11. DeCandole, C. A.: The Treatment of Certain Carriers with Sulfaguanidine, J. R. Army M. Corps, 220 Apr. 1943.
 - 12. Manson-Bahr: Manson's Tropical Diseases, 11th Ed., 1941.
 - 13. Neter, Erwin: Bacteriological Reviews, Vol. 6, No. 1, March 1942.
- 14. Teveli, Z., and Tomasi, G.: Beitrage Zur Atiologie Der Dysenterie, 1935, Arch. Kinderheilk., 110:99-103.
- 15. Haessler, E.: Die Giftarmen Ruhrbazillen, 1935, S. Karger, Berlin, Abhandl. aus der Kinderheilk. und Brenzgebieten, Heft, 39:1-68.
- 16. Koser, S. A., Dorfman, A., and Saunders, F.: Pyridine Derivatives and Other Compounds as Growth-Promoting Substances for Dysentery Bacilli, Proc. Soc. Exp. Biol., 43:391-394.
- 17. Barnes, Roger W., and Kawaichi, George K.: Factors Influencing the Formation of Sulfonamide Urinary Concretions, J. Urol., Balt., 49:324, Feb. 1943
- 18. Dowling, Harry F., and Lepper, Mark H.: Toxic Reactions Following Therapy with Sulfapyridine, Sulfathiazole, and Sulfadiazine, J. Am. M. Ass., 121:1190, 10 Apr. 1943.
- 19. Smyth, C. J., Finkelstein, M. B., Gould, S. E., Koppa, T. M., and Leeder, F. S.: Acute Bacillary Dysentery (Flexner): Treatment with Sulfaguanidine and Soccinylsulfathiazole, J. Am. M. Ass., 121:1325, 24 Apr. 1943.
- 20. Lucchesi, l'ascal F., and Gildersleeve, Nathaniel: J. Pediat., S. Louis, 22:319, March 1943.
- 21. Cornell, V. H., Watt, James, and Dammin, G. J.: Sulfaguanidine in the Control of Shigella Paradysenteriae Infections in Troops, Military Surgeon, 92:253, Mar. 1943.
 - 22. Long, Perrin H.: Connecticut M. J., 7:6, Jan. 1943.



Clinical Survey of Scrub Typhus Fever

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An attempt has been made to correlate the findings in 101 cases of scrub typhus fever admitted and treated in the First Evacuation Hospital, New Guinea. These preliminary observations are made entirely on a clinical basis and without access to autopsy records. The authors hope to submit in the future a more complete report including gross and microscopic studies of autopsy material. The cases reported were admitted to the First Evacuation Hospital between 8 February and 1 September 1943. Eight deaths occurred, yielding a case mortality rate of 7.9 percent. Two fatal cases were clinically diagnosed as large pulmonary emboli occurring after the acute febrile period of the disease had passed. These deaths came on the 19th and 20th days when the patients were lying quietly in bed.

The average duration of the febrile period was 17 days with the two extremes at 10 days and 27 days. The deaths occurred on the 10th, 15th, 16th, 19th, and 20th days. Five of the 8 fatal cases had benign tertian malaria in addition to scrub typhus fever.

While scrub typhus fever is not new, such data as we have been able to find in available textbooks have been meager, particularly as regards clinical pathology, clinical course, and complications. Scrub typhus occurs under a variety of names such as tropical typhus fever, tsutsugamushi fever, flood fever, island fever, and mite-borne typhus fever in Japan, Sumatra, India, Malaya, Formosa, New Guinea, and North Queensland in Australia. The etiological agent is *Rickettsia orientalis*. In Japan transmission is by the larva of the mite *Trombicula*



An article on the pathology of Scrub Typhus by Captain Austin J. Corbett appeared in The Bulletin in November.

akamushi; in Sumatra and Malaya by Trombicula delhiensis; in New Guinea the vector is also a mite.

In New Guinea the disease occurs particularly among troops bivouacked in or near Kunai grass and where rats are prevalent. The larval mite can be picked up directly from the grass or from the rat. It is not definitely known whether other mammals harbor the mite in its infective larval stage. So far as is known it is only the hexapod larval stage of the mite that carries the disease. No evidence has been submitted showing that the eight-legged adult mite is infective.

CLINICAL FEATURES

The incubation period is difficult to determine since the majority of the patients do not know when they were bitten by the typhus-carrying mite and are often unaware of the eschar which forms at the site of the bite. The usual incubation period probably varies from four to twenty-one days. Prior to the onset of fever there may be vague complaints of malaise, chilliness, vertigo, headache, and insomnia. Two patients had been working on barges three days prior to admission and had well-marked vertigo, nausea, and vomiting which were attributed to seasickness. Most of the cases were admitted as malaria, however, or as fever of undetermined origin. The admission complaints may be weakness, headache, backache, insomnia, anorexia, and occasionally swollen inguinal glands. Since many of our cases were complicated by malignant tertian or benign tertian malaria, the admission symptoms were neither distinctive nor pathognomonic of the disease.

Physical examination often reveals an eschar representing the site of the bite. In this series 72 percent showed eschars with marked regional adenopathy, particularly in the inguinal and femoral chains. The eschars varied from 1 to 7 mm. in diameter and consisted as a rule of a single round, raised, black, tough area of necrosis surrounded by a cloudy red areola. Occasionally the necrotic center has dropped out leaving a punched-out, secondarily-infected ulcer. The eschar is so painless that it is rarely noticed by the patient unless situated in an exposed site. In this series the eschars have commonly been located in the axilla, the popliteal space, the shaft of the penis, the anterior surface of the leg and the inner surface of the thigh, the perineum, and the lateral surface of the chest. In addition to the regional adenopathy which is often pronounced, a generalized lymphadenopathy is also



characteristically present. This is true even in the absence of an eschar and is often the first clinical finding pointing to the disease. In two cases, because of the nausea and vomiting accompanying large femoral masses, the patients were sent in with the diagnosis of incarcerated femoral hernia with incomplete intestinal obstruction.

The spleen may become palpable at varying stages of the disease, although this is not a constant finding. Here again malaria complicates the picture since previous or present malarial fever may give a palpable spleen. A tender spleen is not the rule.

The cardiac, pulmonary, abdominal, and otolaryngological examinations are not likely to offer any undue abnormalities at the outset. In describing the course of the disease, further reference will be made to pulmonary, cardiac, and otolaryngological symptoms and signs.

CLINICAL COURSE

By the fifth to eighth day, 85 percent of our cases had a maculopapular, erythematous rash usually appearing first on the lateral or anterior thorax or abdomen, with the extremities least affected. The face was not involved. At the outset the rash would fade on pressure, but after one to two days it faded incompletely or not at all. The rash lasted eight to twelve days, often assuming a light brown, dry appearance as it gradually disappeared.

The febrile stage lasted from 10 to 27 days. The average length was 17 days. A continuous remittent fever from 101° to 102° in the morning to 103° to 104° in the afternoons occurred in the more severe cases. A few cases exhibited an almost straight plateau of fever of about 104° for about a week. Mild cases exhibited fever of 101° to 102° for a week or more. In fulminating cases, the temperature sometimes rose to 105° or 106° between the 10th and the 14th days. In most cases the temperature began to subside by slow lysis on or around the 14th day.

Tachypnea was usually present by the 5th day and reached its greatest intensity between the 7th and 14th days. In the more severe cases it was accompanied by dyspnea. Altered respiratory symptoms were usually out of proportion to the physical findings. A respiratory rate of 28-30 per minute in the more serious cases, usually increased to 36-50 per minute with the onset of pulmonary or cardiac complications.



By the second week of the febrile stage a unilateral or bilateral bronchitis developed in about 30 percent of the cases. The accompanying cough was productive of a tenacious, mucopurulent sputum. As the fever subsided, the bronchitis diminished. Three cases developed small unilateral pleural effusions, confirmed by x-ray, only one of which was preceded by a definite pleuritic pain and friction rub. Bronchopneumonia developed in two cases almost overnight. The white count jumped to 19,000 and 23,000 respectively, with a great preponderance of polymorphoneutrophil leukocytes. Sulfadiazine was without benefit in either case.

Difficulty in hearing was experienced early by over 50 percent of our series of cases. In 20 percent, small, patchy, or wedge-shaped hemorrhages appeared in the bulbar or palpebral conjunctiva. The tongue was usually coated, white or brownish, thick and dry with reddened tip and edges in the more seriously ill patients.

Diarrhea was not the rule. Two or three loose stools a day were not uncommon but of no significance. Tympanites was sometimes present, but occasioned no unusual concern. Anorexia was nearly always present and was occasionally accompanied by nausea and vomiting.

Symptoms referable to the nervous system were usually seen, consisting principally of euphoria, insomnia, delirium, retro-orbital or frontal headache, and muscular twitchings.

Subsultus tendinum was present in 3 cases and carpopedal spasm in 2. The latter was not relieved by intravenous calcium gluconate. Deep prostration was present in the more serious cases by the second week, and a muttering delirium was present in a few cases.

LABORATORY FINDINGS

The blood count was not markedly significant save that a leukopenia was usually present; in protracted cases a moderate hyperchromic anemia developed.

In all cases, a marked decrease in the blood-clotting time and in the prothrombin time was found. The average clotting time using venous blood was 3.5 minutes; the average prothrombin time was 4 minutes; the bleeding time averaged 1½ minutes.

The blood sedimentation rate was markedly increased in 60 percent of the cases and moderately increased in 40 percent of the cases. No prognostic significance was given to the in-



creased capillary fragility which was present in a few of the cases even before the onset of the rash. Urinalyses showed no undue abnormalities.

The Weil-Felix reaction using *Proteus* OXK confirmed the clinical diagnosis in every case by the second week. In critically ill patients a titer of 1/160 was considered diagnostic. In the milder cases, the titer ranged from 1/640 to 1/2580 by the 16th day. The rising titer in these cases became apparent after the 10th day and was significant of the favorable outcome. The 10th to the 14th day was the most favorable time for obtaining a diagnostic titer. In carrying out agglutination reactions, it was found necessary to keep fresh antigen at all times and to guard against *Proteus* cultures changing from smooth to rough.

In appropriate cases, x-ray films were taken in an attempt to establish evidence of pulmonary or cardiac pathology. Some films showed pleural effusions, obliterated costophrenic angles, bronchopneumonia, and cardiac enlargement.

CARDIOVASCULAR SYSTEM

The cardiovascular system was often profoundly affected by the disease..

An early increase occurred in the pulse rate which in uncomplicated cases did not go over 120 per minute. A pulse rate above 120 per minute was of grave significance and frequently a precursor of myocardial failure. The heart sounds in uncomplicated cases were relatively unaffected. Patients with a mild febrile course and presenting no cardiac abnormalities other than tachycardia compatible with the pyrexia, constituted the greater number of our cases. In such cases blood pressure readings were within normal limits.

In the more severe cases, which type comprised about 20 percent of our series, abnormalities referable to the cardio-vascular system were noted. Extrasystoles often were numerous. A soft, blowing, apical, systolic murmur, nonradiating and without demonstrable clinical or x-ray evidence of cardiac enlargement, was not uncommon. A marked accentuation of the pulmonic second sound was frequent. In these latter cases, cyanosis of the lips, mucous membranes, and nail beds was frequently present without dyspnea or clinical evidence of pulmonary congestion.

In the fulminating cases, one or more of the following were noted: cyanosis, severe dyspnea, profound tachycardia,



auricular fibrillation, gallop rhythm, pulsus alternans, cardiac dilatation with definite evidence of congestive failure, a harsh pulmonic systolic murmur, thrombophlebitis and pulmonary emboli; as previously stated, two cases expired from massive pulmonary emboli, death occurring almost immediately in one case and within thirty minutes in the other. One case of pulmonary infarction made an uneventful recovery.

In view of the widespread endothelialitis present in other rickettsial diseases and the decrease in clotting and prothrombin time in scrub typhus, it is suggested that intravascular clotting occurs not infrequently, producing thrombosis and embolus.

TREATMENT

Treatment is nonspecific and largely anticipatory, being directed toward averting cardiac failure and maintaining an adequate state of nutrition. The latter is of particular importance because of the prolonged and excessive fever to which the patient is likely to be subjected. One hundred grams of protein daily by mouth were given in the form of one-quarter pound of beef, supplementing the diet with eggnogs made with fresh or powdered egg and evaporated or powdered milk to which vanilla or chocolate malt was added. Eggs were included in the diet daily.

The fluid intake was maintained at 2,500-3,000 cc. or less depending on the cardiac condition. An attempt was made to keep the specific gravity of the urine within normal limits by daily checking. When considered necessary, the oral fluid intake was supplemented by venoclyses of 5 percent glucose in normal saline or 10 percent glucose in distilled water.

From 1 to 2 units of plasma daily were sometimes used to supplement the protein intake in cases in which the food intake was insufficient. It has been suggested that a high protein intake augments the antibody response. Small transfusions of whole blood were administered when anemia was present.

The barbiturates were used for restlessness or insomnia. Where these were inadequate, morphia in 1/6 to 1/4 grain doses was employed. Oxygen was employed routinely at 6 liters per minute for all cases showing cardiac or pulmonary complications.

Digitalis therapy is used in the treatment of scrub typhus fever with cardiac failure. The usual procedure was oral



digitalization effected in two days with from 1.2 to 1.6 grams in tablet form, and 0.1 gram maintenance dose thereafter. Thiamin chloride and ascorbic acid were used when it was felt that a vitamin deficiency existed.

Malaria when present was adequately treated. It is well to guard against latent or asymptomatic malaria during the febrile stage of typhus. Any sudden or unusual temperature elevation was regarded as a possible evidence of malaria, whereupon the parasite was diligently searched for. Sulfadiazine was employed in two cases complicated by bronchopneumonia with no appreciable beneficial results. Thorough nursing care is, of course, essential. Other treatment was entirely symptomatic.

Because of the protean manifestations of the disease, treatment cannot be standardized. Good nursing care is sine qua non in the treatment of the disease. Adequate fluid intake, sufficient protein intake, sedation and the prompt combatting of complications as they arise are the sheet anchor on which successful management of the case depends. Many decisions must be made concerning which steps will most benefit the patient. Often alleviation of one symptom will not be without hazard so far as concerns the various systems of the body affected by the disease. The question of adequate fluid balance and parenteral therapy often posed a difficult decision. In the patients with cardiac complications and hyperpyrexia the maintenance of adequate fluid intake by oral or parenteral means without placing an additional burden on the heart will often tax the physician. Patients with incipient and full-blown cardiac decompensation will have a fever of 104° and 105° with dehydration. The pulmonary system may become engorged but the general tissues become dry. Anorexia, nausea, and vomiting will often cause the loss of precious nutritive material and fluids. Parenteral therapy in these patients is never to be taken lightly. Not only is there a danger of overloading a damaged heart, but the possibility of mechanically damaging the blood vessels which are perhaps the seat of an endothelialitis must be considered. We feel that in scrub typhus there is a tendency for thrombotic phenomena to occur. and so the "pro and con" of parenteral therapy must be carefully weighted with each individual case. Does the possible restorative value of glucose solutions on damaged myocardial tissue outweigh the danger of tampering with damaged blood



vessels? As a group the sthenic and obese patients developed cardiac complications more often than did the asthenic, thin type of individual. The burden of recovery rests in many cases in the myocardium.

COMPLICATIONS

The following complications were noted: myocarditis without obvious congestive failure; myocarditis with cardiac dilatation and congestive heart failure; pulmonary embolus; thrombophlebitis of the femoral veins; toxic psychoses; deafness, incomplete; hyperpyrexia; transient, complete, left ulnar nerve paralysis; bronchitis; pleural effusion.

It is well to stress a few points. Scrub typhus fever may run an entirely mild course with relatively low-grade temperature ranging from 99° to 102°. However, regardless of the severity of the infection all cases in their convalescence should have a period of prolonged bed rest following a regimen akin to that used in rheumatic fever and postdiphtheritic heart disease. Every case should have electrocardiogram studies in order accurately to assess cardiac damage of which there is perhaps more than is immediately apparent. In justice to the patient, extremely careful study should be made before returning the patient to full or limited duty.

AN INTEGRAL FACTOR IN MENTAL HYGIENE

Morale is an intangible necessity without which no army can Soldiers with inferior weapons and equipment be successful. but with high morale can overcome an enemy with the best equipment but low morale. The Army is well aware of this, and through its Special Service Division has accomplished much by encouraging athletics, recreation, and entertainment as diversions. A Special Service officer is assigned to each post and unit. Frequent physical inspections are conducted, since poor health can seriously interfere with morale. The selection, preparation, and serving of food are closely supervised, as it is well known that plenty of good food is one of the prime supports of good morale in any group of men. Morale, however, is far more than entertainment and diversion. As a matter of fact, it is an integral factor in mental hygiene. (Halloran, Roy D., and Farrell, Malcolm J.: The Function of Neurophychiatry in the Army, Am. J. Psychiat., 100:14-20, July 1943)



Staphylococcal Enterotoxin in Bread Pudding

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This report relates to an outbreak of a large number of characteristic staphylococcal cases of food poisoning. Enterotoxigenic producing staphylococci were obtained from bread pudding served at the meal following which the outbreak occurred. The bread pudding had been stored beneath a steam table for sixteen hours before serving at temperatures favorable for enterotoxin production. About 400 men were affected following an evening meal at which 600 men were served. The most severe cases were among 500 men fed at the main mess. This group was served later than those less severely affected, and prior to this serving the pudding was again mixed and additional milk added. Of the large number affected, about 25 percent were described as severe or shock cases. The case history information was furnished through the courtesy of Captain R. R. Bidwell, M.C. The symptoms were reported to have occurred three to four hours after the pudding was served. Six officers who ate servings of the pudding two hours after it had been prepared were not affected.

The bread pudding consisted of bread chopped with a hand knife, pasteurized milk, evaporated milk, dried apricots, sugar, and eggs. Following its preparation the pudding was placed on a shelf beneath a steam table and held until served at the evening mess of the following day. The table had been heated for one-hour periods during the morning and noon mess; other than at these periods, the pudding was held at about 75° F.

TESTS

A kitten, two months old, was fed two grams of the pudding, but no gastro-intestinal symptoms developed.

The results obtained from streaking culture media with the pudding were as follows: Black colonies with a metallic sheen characteristic of *Escherichia coli* were obtained from eosin methylene blue plates. The gram-negative rods obtained from these colonies fermented lactose with acid and gas production.



This organism was methyl red positive, Voges-Proskauer negative, and citrate negative. On agar plates following twenty-four hours' incubation, light yellow pigmented colonies of staphylococci were observed. A more intense yellow pigment developed on the agar plates following an additional period of twelve hours at room temperature. Extensive hemolysis was observed on rabbit blood plates; however, only slight hemolysis was produced on human blood plates. The organism gave a positive reading on Stone's medium and was also positive in rabbit plasma for coagulase production.

ENTEROTOXIN TEST

Two types of media, veal infusion and the vitamin medium of Favorite and Hammon, were used for enterotoxin production tests. The veal infusion, Difco, adjusted to pH 7.6, and the vitamin medium were inoculated with colonies from the blood agar and incubated for seventy-two hours in 20 percent CO₂ atmosphere. Heavy growth was observed in the veal medium following seventy-two hours' incubation. Smears from the veal medium demonstrated the presence of staphylococci. Growth in the vitamin medium was not as heavy following seventy-two hours' incubation as was the growth in veal infusion. Samples from both media were centrifuged to remove the organisms. To inactivate other staphylococcal toxins, the samples were subjected to heat in boiling water for thirty minutes.

As control tests, two other staphylococci cultures were inoculated into veal and vitamin media, and their filtrates were used for intravenous injections into kittens. Table I shows the results obtained from filtrate injections.

Kitten	Culture filtrates	Media	Result s				
1	Pudding culture	Veal	Vomiting in 30 min.				
2	Pudding culture*	Vitamin	Negative				
3	Pudding culture**	Vitamin	Vomiting in 40 min.				
4	859	Veal	Negative				
5	161	Veal	Vomiting in 50 min.				

TABLE · I
Intravenous tests on kittens

^{*}Filtrate injected following seventy-two hours' incubation.
**Filtrate injected following seventy-two hours at 37½° F. plus ninety-six hours at room temperature.



Culture 859 was used as a negative control while culture 161, a known enterotoxin producer, was used as a positive check. The injections were made into the radial vein at a point just dorsal to the carpus. Dr. G. M. Dack supplied the culture of this staphylococcus.

SUMMARY

In an outbreak of food poisoning, an enterotoxigenic strain of staphylococcus was obtained from a sample of bread pudding which had been served to the 400 affected.

These cases of food poisoning demonstrate the need for adequate refrigeration facilities and the necessity of adherence to the use of these facilities for certain food products.

REFERENCE

Favorite, Grant O., and Hammon, William McD.: The Production of Staphylococcus Enterotoxin and Alpha Hemolysin in a Simplified Medium, J. Bact., Balt., Vol. 41, No. 3, March 1941, pp. 305-316.

ANTISCORBUTIC SUBSTANCES DERIVED FROM CONIFEROUS TREES

Bela Schick¹ comments on Donnelly's brief contribution in Science of 6 August 1943, which called attention to the work of Shishkin on the use of pine needles as an antiscorbutic. Schick says that Tobler discussed the subject in 1918, after studying scurvy in the children's clinic of the University of Vienna following the first World War. Tobler prepared a pine needle tea by pouring boiling water over crushed needles and allowing the extraction to continue until the water took on an "exquisite aroma of pine needles." The tea is said to be a pleasant drink. Children were sent into the woods to collect the needles and were given one cup of the tea daily.

Pine needle tea was successfully used by the Swedish Army, probably during the invasion of the Ukraine by Charles XII in 1708 and 1709, to stop the progress of scurvy which affected nearly all of Sweden's soldiers. Our own Francis Parkman, the seventeenth edition of whose book, *Pioneers of France in the New World*, was published in 1880, apparently knew of the antiscorbutic effect of a decoction of evergreen.



^{1.} Science, 10 September 1943.

Neuromuscular Electrodiagnosis (An Outline)

CAPTAIN SIDNEY LICHT

Medical Corps, Army of the United States

Electrodiagnosis has not received the attention its importance warrants, in this country. During peacetime the number of peripheral nerve lesions is small, and the clinician has sufficient time to evaluate damage and progress by tedious muscle function tests. The number of nerve injuries resulting from combat casualties is so great that rapid methods of diagnosis are desirable. Electrodiagnosis is rapid, exact, and independent of patient cooperation. In a few diseases it offers positive confirmation of diagnosis. This article offers no new information, but catalogues briefly those tests which are of greatest value in military medicine, and which to the author's knowledge are not available under one cover in the English language.

All examinations listed can be conducted with any simple apparatus which delivers the galvanic and faradic current. Testing is simplified for both patient and operator when both assume comfortable positions. Whenever possible, the patient should be recumbent and the examiner seated. Both electrodes should be quite wet. Tap water is as satisfactory for routine purposes as saline solution. The testing electrode should be equipped with a circuit breaking key and connected to the negative pole.

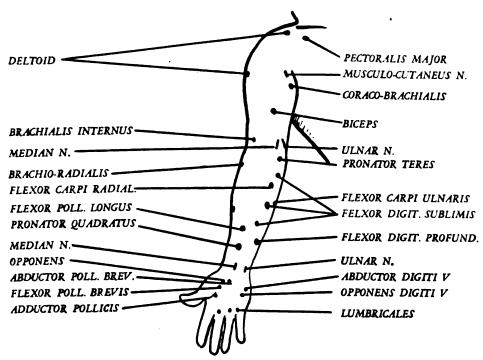
ROUTINE EXAMINATION

The skin area overlying the entrance of a motor nerve into the muscle it supplies is known as the motor point. At that point the muscle is most easily excited electrically. It is difficult to remember the location of motor points unless electro-testing is a daily procedure. A simple motor-point chart is appended to this discussion. Seek the motor point with the galvanic current first. Some muscles, such as the biceps brachii, require far less current for threshold contraction than others such as the rectus femoris. The skin in some areas is more sensitive than in others. The most sensitive area is usually found in the forehead. The greater the current used, the more pain. An attempt should be

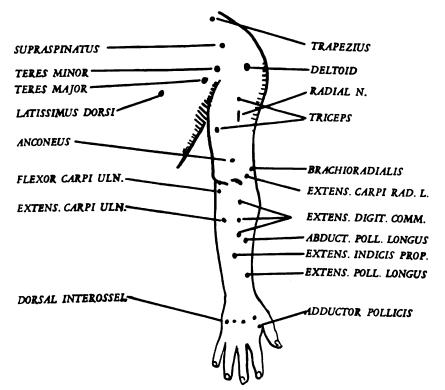


MOTOR POINT CHART

Upper Extremity - Anterior

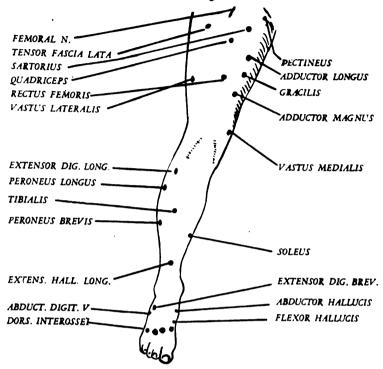


Upper Extremity - Posterior

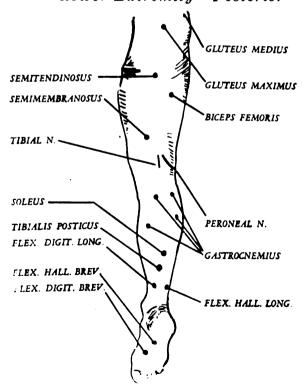


MOTOR POINT CHART (Cont.)

Lower Extremity - Anterior



Lower Extremity - Posterior



made to use the smallest amount of current which will elicit an obvious contraction. The stimulating electrode should be moved until the minimal current gives a maximum contraction. Once having found the motor point, an attempt should be made to keep the stimulating electrode in that position while the current is changed to faradic. Apply stimuli briskly and for short periods. There is no need for the current to flow after contraction is seen. Examination of symmetrical muscles is the key to proper evaluation of response.

The usual response to a weak galvanic cathodal stimulus is a brisk contraction followed by a rapid relaxation. In some nerves (radial) and in some patients the muscle may remain contracted during current passage. This is known as galvanotonus and its significance is not known. In recent nerve section, the response to galvanic stimulation may be the same as to that of an intact nerve. In injuries of only a few days' duration, the nerve may be even more easily excited than the corresponding symmetrical nerve. As time progresses, if the pathology of the nerve is unimproved, the muscle contraction becomes more sluggish and after a period of many months may become worm-like. Eventually if muscle atrophy becomes complete no contraction to galvanic stimulus will be noted. Reversal of Erb's formula is late and not worth the effort of discovery.

Normal faradic response is a tonic contraction for the duration of current flow. If increased current does not elicit a contraction, it should be still further increased to the point of pain. If there is still no contraction of the stimulated muscle, reaction of degeneration (R.D.) is diagnosed. Confusion may result from intense faradic stimulation when the spread of current will contract neighboring muscles. Close scrutiny will show that these are frequently antagonists. If the response to strong faradic stimulation is weak but definite (compared with opposite side) a diagnosis of partial reaction of degeneration is made (P.R.D.) P.R.D. is seen in disease of part of a nerve, such as a partially sectioned nerve or during the gradual return of nerve function.

When muscle bellies are close to each other, it is sometimes difficult to determine which one is responding to stimulation. In such cases instead of relying on joint motion, the tendon of insertion should be palpated during the contraction. In this manner it is easy to distinguish between the contractions of neighboring muscles of similar action such as the palmaris longus and the wrist flexors. Occasionally, voluntary motion may return in



a muscle before faradic excitability, but if a muscle responds to faradic stimulation, its nerve segment is intact at the time.

The motor point corresponds anatomically to the site at which the nerve penetrates the muscle fibers. The "shift of the motor point" is in reality the disappearance of maximum excitability from the point of former nerve entrance and signifies complete nerve destruction. The new point of maximum excitability appears to be nearer the tendon of insertion because in that area, motion of the muscle is more apparent than elsewhere, since tendons move longitudinally (easily visualized) whereas muscle fibers shorten during contraction.

There are several diseases in which muscle-nerve testing is a great aid in differential diagnosis. Inasmuch as the group is heterogenous they are listed alphabetically.

DIFFERENTIAL DIAGNOSIS

Bell's palsy should be electrically tested and treated as soon as possible. If in spite of clinical palsy, the electrical reactions remain normal for the first fourteen days, a complete and rapid return of function can be predicted. If R.D. remains complete, it is unlikely that function will return before a period of about three months. In the average patient, there will be little change in muscle reactions beyond the status noted at the sixth month.

Hysterical paralysis. This condition is usually apparent to the physician from the history of onset and course and the bizarre clinical features. Absence of R.D. completes the diagnosis and is usually the first step toward recovery because the patient sees his limbs move, and if the current is made sufficiently strong he will dislike it to the point of getting well. The presence of R.D. would immediately negate the diagnosis of hysteria in the nerves involved.

Myasthenia gravis. In normal muscles the interrupted stimulation of a muscle with the faradic current may be continued indefinitely without muscle fatigue. In this disease, a simple rapid examination known as the Jolly test³ is confirmatory. With the patient lying down and the operator's elbow resting on the plinth next the head, the stimulating electrode (small tip) is applied to the orbicularis oculi muscle. The faradic current is admitted at a rate of about one hundred times per minute (man-

3. Jolly, F.: Ueber Myasthenia Gravis pseudoparalytica, Berl. med. ges., p. 6. 1894.



^{1.} Van Ziemmsen, H.: Die Electricitat in der Medicin. Berlin, 1864.
2. Mann, L.: The Actual Status of Electrodiagnosis, Arch. electr. med., 11:23, 1903.

ual interruption). In myasthenia gravis, the muscle will respond to each stimulus with a diminishing contraction until contractions cease. This will occur in from twenty seconds to a few minutes. If contractions continue for more than ten minutes, the test is negative. Even the use of prostigmine will not invalidate the test although it will prolong the pre-fatigue period somewhat.

Myotonia congenita. This disease, which is characterized by long-standing although not necessarily incapacitating weakness, makes motions difficult to initiate but once started permits repetition with increasing ease. The following electrical reactions can be observed on most of the muscles of the extremities. Stimulation with the direct current under the negative pole results in a brisk contraction followed by a tetanic contraction which persists for from one to ten seconds after the current has ceased to flow. Under the positive pole with galvanic stimulation, the initial contraction is not brisk but builds up visibly to a tonic spasm which persists after the current has ceased. Brief faradic stimuli give brief contractions. If the faradic current is prolonged a post-stimulation contraction resolves slowly, although not quite so slowly as after galvanic stimulation. The pathognomonic finding is the board-like contraction which persists after stimulation has been discontinued. When this reaction (myotonic) is found in the presence of a suggestive history the diagnosis is confirmed.4 The exhibition of quinine does not alter the reaction qualitatively.

Poliomyelitis. In the early phases involved muscles will show R.D. of P.R.D. depending upon extent of lesion. In some patients whose muscles are severely involved there may not be any contraction with either galvanic or faradic stimulation.

Polyneuronitis. In this heterogenous group are included those patients with symptoms of marked peripheral nerve shock associated with generalized toxic reaction. Electrical examination is usually made difficult by the increased sensitivity of the skin to electrical and other stimuli. The muscles may show a peculiar distribution of R.D. and P.R.D. Two muscles may appear equally involved yet one will show R.D. and the other will respond normally. As the recovery period progresses, the skin hypersensitivity diminshes and R.D. where present changes to P.R.D. during recovery.⁵

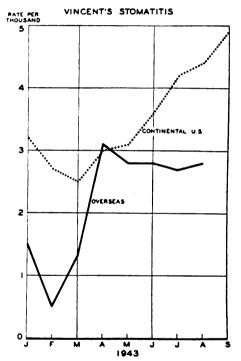
Erb, W.: Die Thomsen'sche Krankheit. Leipzig, 1886.
 Zimmern, A., and Perol, P.: Electrodiagnostic de Guerre. Paris, 1917.



Wilson's disease. This disease is characterized by hemianesthesia and pupillary reaction to pain. If faradic stimulation of the extremity muscles of such a patient shows a myodystonic contraction (R.M.D.) the diagnosis of Wilson's disease is most likely. The myodystonic reaction consists of slow disconnected contractions during and after faradic stimulation.

VINCENT'S STOMATITIS (TRENCH MOUTH)

The incidence of Vincent's stomatitis during 1942 for the continental United States was a little less than three per thousand troops per month,



which was only slightly higher than for the years 1940 and 1941. There is a definite tendency, however, as indicated in the chart, toward an increase since April of 1943.

The overseas rate for 1942 has been about one-third that of continental United States. This remarkably low rate was probably influenced by the lack of personal contact of the troops with the civilian population. Another controlling factor was a good nutritional regimen in addition to an acceptable oral hygiene measure. The incidence in overseas troops has definitely increased since the early part of 1943, probably the result of greater combat activity which did not permit routine oral hygiene measures.

While the over-all rate in this country and overseas is still relatively

low, precaution must be exercised in the control of this infection. Every dental patient and soldier should be informed and impressed with the seriousness of Vincent's stomatitis.

Circular Letter No. 50, S.G.O., 12 April 1943, subject, Stomatitis Vincent's, outlines some of the causes, measures of control, symptoms, and suggested treatment.

^{6.} Soderbergh, G.: The Myodystonic Reaction, Acta Med. Scand., 56: 585, 1922.

The Acrylic Half-Splint

Major Leo Mackta

Dental Corps, Army of the United States

The author has had occasion, at times, to construct a modification of the sectional acrylic splint¹ commonly employed in the Army, in cases where splints were desirable but where it was impossible to take the required impression. The most common reasons for inability to take the ordinary impressions were trismus from the edema of trauma or after intermaxillary closure for some time and displacement and mobility of the parts to an extent where they could not be held together sufficiently for an open-mouth impression.

The modification consists of a continuous labial section of splint, attached to the teeth by wires passing through holes drilled in the splint at the interproximal spaces. It has the advantage of being more comfortable to the patient than some of the other splints since it does not encroach on the tongue space. Square tubes, extension arms, and spring wires may be incorporated in the half-splint.

IMPRESSION TECHNIQUE

A closed-bite impression is taken, with the teeth held in occlusion by manual pressure. The chin is cupped in the hand and pressure is applied wherever necessary to keep the bite closed. The patient may in some instances be able to perform this service himself since he can feel whether the occlusion is being displaced during the time the impression is taken.

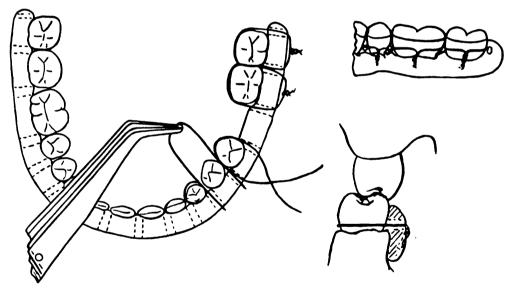
A split compound-plaster impression is taken. A roll of soft compound is worked around one side of the arch, from the midline to the most posterior tooth, which is then pressed against the upper and lower teeth when in occlusion. The lower or upper gingivae are included beyond the extent to which it is desired to carry the finished splint. The compound is chilled and removed, and a butt end is cut at the midline. It is lubricated, replaced in the mouth, and a similar procedure is carried out on the other side, having the two pieces of com-

^{1.} Manual of Standard Practice of Plastic and Maxillofacial Surgery, pp. 322-338, National Research Council. Philadelphia: W. B. Saunders Co., 1942.



pound meeting at the butt joint. The impression is again removed and a trough is cut for the plaster, leaving the compound intact in that section of the arch which is not to have the splint, so that it can act as a stop as well as be utilized to position the tray. The trough is made with adequate undercuts so that the plaster will withdraw with the compound tray.

Next the plaster wash is taken, both halves of the tray being placed simultaneously and jiggled into place. After the plaster is set, each tray is broken away separately and the two reassembled with sticky wax. A stone model is poured and the splint waxed up similarly to the labial section of the splint commonly employed by the Army. The occlusion is automatically taken care of, since the model includes the opposing arch. No buttons need be waxed in, since no midline split will be made, and intermaxillary attachment may easily be made to the wires which fasten to the teeth. The model is then bevelled away from the wax-up with a rasp and flasked.



Clear acrylic is necessary, since one must see to "fish" the wires through the holes in the splint. After it is processed, trimmed, and polished, holes are drilled through the splint from the inside, at the gingival marking of each interproximal space. It may be necessary to blunt some of the interproximal markings of the posterior teeth to allow the splint to go to place.

INSERTION

The mouth need be opened only far enough to insert a hemostat or cotton pliers with which to pass separate loops of



wire around the lingual surfaces of the teeth and through the interproximal spaces, to emerge through the holes in the splint. All, or as many teeth as are desired, may be included in the wiring. The ends of the wire loop are twisted together over the outside of the splint and the ends turned down. Recesses may be cut into the acrylic to countersink the ends if desired. The twisted ends may also be used for attaching intermaxillary elastics. The accompanying drawing shows the method of wiring the splint to the teeth.

While this type of splint is not intended to be a substitute for the sectional splint commonly employed by the Army, the advantage of being able to take an impression of the arch with the teeth held in occlusion is obvious. It is offered for its simplicity and its utility where other splints cannot be used.

CARE OF DENTAL ANGLE HANDPIECES

Carbon steel has been employed in the making of angle handpieces to facilitate production and to meet the increased demands of the Army Dental Corps. Since angle handpieces made from this material corrodes more readily than those made from stainless steel, greater care must be exercised in the use of this item. The examination of many angle handpieces indicates clearly that one of the chief reasons for unserviceability is the lack of proper care. All angle handpieces will be cleaned by running in kerosene daily, followed by proper lubrication.

Attention is directed to paragraph 2a(1) of AR 35-6640, which states, "If any article of public property is lost or damaged through the fault or neglect of any officer or enlisted man, he will be required to pay the value thereof."

MEETING OF MEDICAL OFFICERS

Air Marshal Sir Harold Wittingham of England addressed the second autumn monthly meeting of medical officers at the Army Medical Center, Washington, 18 October 1943. Brigadier General Fred W. Rankin, consultant in surgery, Surgeon General's Office, spoke on "Observations on a Recent Visit to Theaters of Operations," and Colonel Crawford W. Sams, M.C., recently returned from overseas service and now at the Medical Field Service School, Carlisle Barracks, Pennsylvania, spoke on "Medical Experience in the Middle East."



Hysterical Amblyopia

Report of Cases

CAPTAIN HAROLD J. HALPERN
Medical Corps, Army of the United States

Hysterical amblyopia is frequently seen in civilian life and in the Army. The 15 cases reported here are presented primarily because of the definite etiology involved.

These cases were seen at a pre-embarkation staging camp. The men were members of task force units in camp from two to six days and were in the process of being prepared for overseas duty. Eleven of the 15 cases stated that their loss of vision had come on suddenly without any warning. Three of the patients said that their visual loss had been progressive for one to two months, and one patient said that the condition was five months old and was getting worse; of these cases, this one made the most satisfactory recovery.

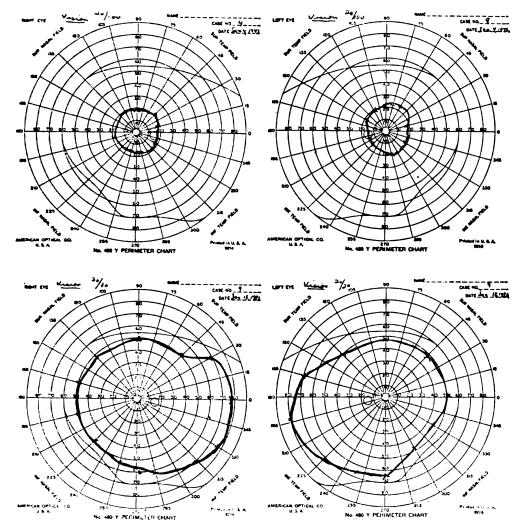
All the cases were admitted to the hospital. Neuropsychiatric consultations were held, and in all but one case the psychiatrist reported that other psychiatric symptoms were present or had been present at some time in the patients' history. The soldiers who were all apparently in good physical health, ranged in age from 20 to 37 years; ten of them were white and five were colored. Careful physical examinations were done and, except for one case which had a functional heart murmur, no serious pathology was noted.

Four of the patients were found to have a chronic sinusitis involving the maxillary and ethmoidal sinuses; however, the infection was deemed to be of long standing with no apparent etiologic effect on the visual loss. There were no positive neurologic findings.

The eye examination revealed the typical signs of hysterical amblyopia. Vision which apparently had been normal, had decreased so that it varied in all the cases from 10/400 to 20/60. Thirteen of the cases gave no previous history of eye disease. The remaining cases gave vague histories of pains over both eyes. The absence of any previous ocular history is



important in arriving at a diagnosis of hysterical amblyopia. Perimetric examinations were done on all patients for peripheral vision. A 2 mm. and a 10 mm. white test object were used in addition to a 5 mm. red test object. Ten of the 15 cases showed a concentric tubular contraction, all below 20 degrees; three of the cases showed a moderate contraction from 20 to



The two upper charts show the peripheral fields taken on case No. 9, using a 2 mm. white test object. Note typical concentric tubular contraction. Visual acuity OD 20/100 OS 20/100.

The two lower charts show the peripheral fields taken on same patient fourteen days later. Note return of peripheral field of vision. Visual aculty OD 20/30 OS 20/20.

40 degrees. Two showed little or no field changes. Ring scotomas with a reversal of color fields were present in a majority of the cases, but on repeated examinations the results were found to be inconsistent in the same individuals. The pupils reacted to light and in accommodation normally in 12



TABLE I

TABLE I									
No.	Vision on admission	Fields on admission	Vision on discharge	Fields on discharge	Time in hospital				
1	OD 10/400 OS 10/400	Concentric tubular contraction	OD 20/70 OS 20/70	Moderate contraction	20 days				
2	OD 20/400 OS 20/100	Concentric tubular contraction	OD 20/100 OS 20/40	Slight improvement	9 days				
3	OD 20/200 OS 20/400	Moderate contraction	OD 20/20 OS 20/20	Normal	15 days				
4	OD 20/300 OS 20/400	Concentric tubular contraction	OD 20/100 OS 20/60	Moderate contraction	19 da ys				
5	OD 20/200 OS 20/60	Concentric tubular contraction	OD 20/70 OS 20/50	Slight improvement	20 days				
6	OD 20/200 OS 20/100	Moderate contraction	OD 20/40 OS 20/40	Normal	16 days				
7	OD 20/200 OS 15/400	Concentric tubular contraction	OD 20/40 OS 20/30	Moderate contraction	25 days				
8	OD 20/400 OS 20/200	Concentric tubular contraction	OD 20/70 OS 20/80	Normal	12 days				
9	OD 20/100 OS 20/100	Concentric tubular contraction	OD 20/30 OS 20/20	Normal	16 days				
10	OD 20/70 OS 20/100	Normal	OD 20/30 OS 20/30	Normal	10 days				
11	OD 20/200 OS 20/300	Concentric tubular contraction	OD 20/50 OS 20/40	Moderate contraction	29 days				
12	OD 20/100 OS 20/70	Concentric tubular contraction	OD 20/20 OS 20/20	Normal	14 days				
13	OD 20/70 OS 20/80	Normal	OD 20/50 OS 20/30	Normal	17 days				
14	OD 20/200 OS 20/100	Concentric tubular contraction	OD 20/70 OS 20/40	Norma!	12 days				
15	OD 20/100 OS 20/100	Moderate contraction	OD 20/30 OS 20/40	Normal	21 days				



cases, and sluggishly in 3 cases. Corneal reflexes were present in 14 of the cases. Cycloplegic refractions were done on all cases and no marked refractive errors were found. Eight of the cases were hyperopic with small astigmatic errors, 2 were myopic, and the remaining 5 were emmetropic. No muscle imbalances of any remarkable degree were found, and the funduscopic examinations were normal.

The blood serology, blood counts, and urinalysis were normal. The patients were allowed out of bed at all times and given a full diet. Seven of the cases received zinc sulfate 1/5 percent as a placebo, and the other 8 received no treatment. Vision and field examination were checked every three days, and improvement was apparent after the second examination. All of the cases were discharged within a period of nine to thirty days.

SUMMARY

In fifteen cases of hysterical amblyopia observed at a pre-embarkation staging camp, the factor of imminent overseas duty is believed to have been the primary etiologic agent. Hospitalization with no treatment was sufficient to cause an alleviation of the symptoms. The theoretical removal of the threat of immediate overseas duty was an important factor in the recovery.

EMERGENCY FOOD PLANTS IN THE PACIFIC ISLANDS

The War Department has recently had published a pocket-sized Technical Manual (TM 10-420), Emergency Food Plants and Poisonous Plants of the Islands of the Pacific. This manual is intended to aid the individual who becomes separated from his unit, by describing and illustrating the edible and poisonous plants so that he can live off the land. The manual, written by Dr. E. D. Merrill, Director of the Arnold Arboretum, Harvard University, covers all of Polynesia, Melanesia, Micronesia, the Malay Archipelago, the Philippines, and for all practical purposes, Indo-China, Thailand, Burma, and eastern India. It is for sale by the Superintendent of Documents, United States Government Printing Office, Washington, D. C., for fifteen cents a copy.



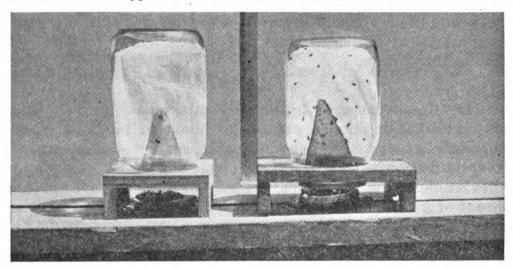
Apparatus

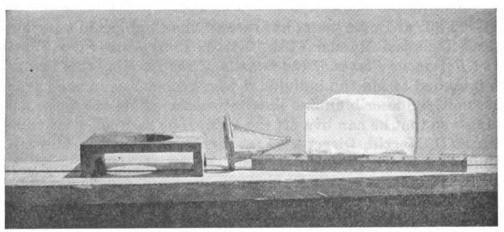
FLY TRAP MADE OF SALVAGED MATERIALS

CAPTAIN SIDNEY M. MARKS Sanitary Corps, Army of the United States

A successful fly trap built of salvaged materials has been in use at the Nashville Army Air Center, Nashville, Tennessee, since the beginning of the 1943 fly season.

It has been used to supplement the standard screen fly traps. In operation these traps have proved to be far more efficient than the usual No. 16 wire mesh types. The reason for the increased effectiveness can be





Front and side views of fly trap

found in the underlying principle of all fly traps, primarily that a fly after feeding moves upward toward the light. The glass jar provides ample overhead illumination to attract the insects.



The fly trap is constructed by placing a cone of screen wire into a gallon-size glass container and mounting the ensemble on a wooden stand. "Kraft Mayonnaise" gallon-sized jars form the best traps because their wide mouths give a maximum catchment area. The cones are made of window screen remnants joined together either with staples (using the ordinary office machine) or by soldering.

By experiment a cone extending half way into the jar has been found to give the best results. The opening at the small end should be about ½ inch wide with the ends splayed outward.

The large end of the cone should be fitted into the edge of the metal cover which is cut out to form the opening. Such construction facilitates cleaning of the trap by merely unscrewing the cap after immersing in warm soapy water.

In the accompanying photographs, the bait shown is bread and jam but any of the standard fly baits may be used.

It is suggested that such traps be used in locations where larger units would be impractical such as between G. I. cans, or garbage racks, and near doors on porches.

METHOD FOR REPRODUCTION OF TRAINING CHARTS

FIRST LIEUT. WILLIAM H. STERNBERG Medical Corps, Army of the United States

The need for supplying an adequate number of good instructional charts for training is a recurrent one in all branches of the service. It is particularly important in the Medical Corps where, in a limited time, the enlisted men must be taught a large number of highly technical subjects. Training in anatomy, physiology, laboratory work, etc., is ineffective without adequate visual aids. A method of reproduction of training charts that is economical, rapid, and adaptable to most Army camps is needed.

In the medical section of the New Orleans Army Service Forces Unit Training Center a technique has been devised which fits these requirements and permits the rapid reproduction in color of large numbers of training charts. The method employs a blueprint machine, using the Directo black-line positive technique. The blueprint machine will be available at the Engineers' department of most camps. In setting up a Reproduction Department, it is usually possible in any large organization to select a small number of officers or men with some skill and experience in art work.

Technique

The original drawing from which prints will be produced is made on draftsmen's tracing vellum paper. The preliminary drawing and lettering are laid out lightly with a blue pencil crayon (the blue will not reproduce; therefore, it need not be erased later). Lettering and most of the drawing are then done with black India ink, using speed-ball pens of various sizes. The Directo black-line method reproduces shading excellently, and for this purpose a black pencil crayon, relatively greaseless, is used. Shading can be introduced on the vellum paper very rapidly with the use of this crayon. The finished original drawing may be sprayed with fixative to prevent smudging of the crayon, although this factor is small, with careful handling, even on repeated reproduction.



Any number of reproductions may be made from this original, using Directo black-line sensitive paper on the blueprint machine. The original on vellum paper is placed in contact with the sensitive paper, run through the machine, then developed on the developing machine. For the best visibility the timing of the blueprint machine is set so that the background is almost entirely decolorized, without prolonging the exposure to such an extent that the shading is lost.

Subsequently, the charts may be colored. This is accomplished with the use of washes of colored drawing inks diluted with water and applied with large water-color brushes. Colored inks are useful since they provide brilliant color, are waterproof, and are transparent, thus permitting the black line and shading of the print to show through. Since the shading is already present in the print, it is not necessary to spend much time shading with the colors. Flat washes of colored ink may be applied directly to the prints on a "mass production" scale. The use of color improves the visibility of the chart.

With this method, charts up to 42 inches in width and of any length can be produced. The size of the chart should be that which will permit good visibility, depending on the size of the classroom. The lettering should be simple and large enough to be seen readily from the back of the classroom. Simplification both in design and conception is also a major factor in good chart production. The intelligent simplification of the content of a chart to its basic essentials is perhaps the most difficult problem to be surmounted.

The material used for originals include tracing vellum paper, black India ink, lettering pens, black pencil crayon (relatively greaseless), and fixative and a spray gun.

Materials used for printing are blueprint machine, such as the Peck B-2; developing machine, such as the Dietzgen 4370G; Directo black-line sensitive printing paper No. 250-F, medium or heavy (rolls come in widths of 36 or 42 inches); and black-line developing powder, 239-4.

Materials used for coloring charts include colored waterproof drawing inks (red, blue, yellow, orange, green, and brown), water-color brushes, and mixing pans.

The charts, when completed, are rimmed with gummed linen tape for better wear. A set of ten or more charts is bound together at their upper borders by nailing or screwing them between two batten strips or half-rounds. These wooden strips, which project beyond the edges of the chart, also serve in suspending the charts in racks.

In the classrooms of the Medical Section of the New Orleans Unit Training Center, wooden racks are kept, which hold ten sets, each with about ten charts. When the charts are used, a set is removed from the rack, suspended on hooks in the front of the rack, and as each chart is viewed, it is turned back showing the next chart underneath.

The advantages of this method of reproduction are: 1. Speed.

- 2. The availability of blue-print machines in most military posts.
- 3. The process is cheaper than the use of the photostat and most photostats will not provide the large prints needed for charts. The cost of a chart, 36 inches square, should be about six cents compared with several dollars for a photostat reproduction.



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